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National Aeronautics and Space Administration

SPACE SHUTTLE MISSION STS-83

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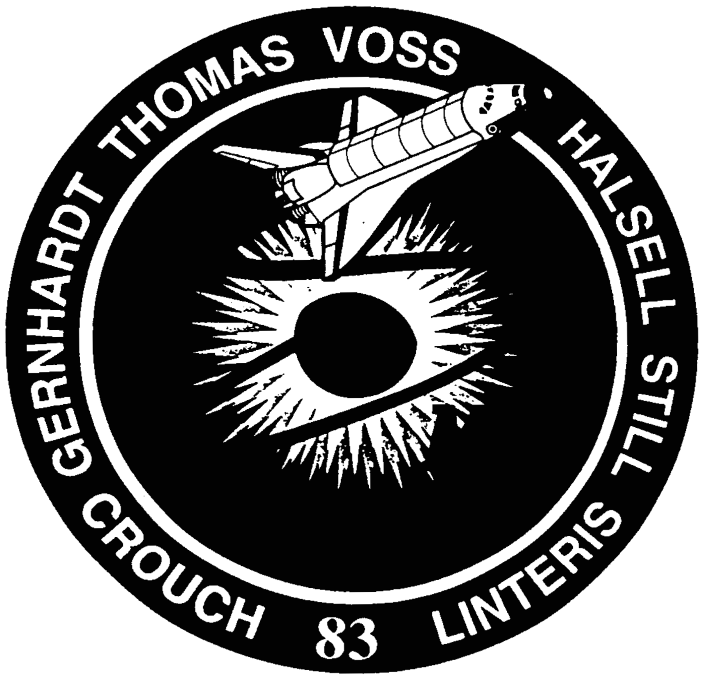

MICROGRAVITY SCIENCE LABORATORY-1 (MSL-1)

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NASA PAO CONTACTS

Debra Rahn Headquarters Washington, D.C.	Space Shuttle Mission Policy/Mgmt	202/358-1639
Mike Braukus Headquarters Washington, D.C.	Life & Microgravity Sciences Policy/Mgmt	202/358-1979
Kyle Herring / Ed Campion Johnson Space Center Houston, TX	Mission Operations / Astronauts	281/483-5111
Steve Roy Marshall Space Flight Center Huntsville, AL	MSL Experiments	205/544-0034
Lisa Malone / Dave Dickinson Kennedy Space Center, FL	Launch Processing / KSC Landing Info.	407/867-2468
Cam Martin Dryden Flight Research Center Edwards, CA	DFRC Landing Info	805/258-3448
June Malone Marshall Space Flight Center Huntsville, AL	External Tank / Shuttle	

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MICROGRAVITY RESEARCH HIGHLIGHTS MISSION STS-83

NASA's continuing effort to understand the subtle and complex phenomena associated with the influence of gravity in many aspects of our daily life will be the focus of the upcoming STS-83 Microgravity Science Laboratory (MSL-1) mission. The flight will involve Shuttle Columbia and her seven astronauts spending more than two weeks in orbit as they conduct a variety of experiments to examine how various materials and liquids change and behave in the weightless environment of space.

The STS-83 crew will be commanded by Jim Halsell, who will be making his third Shuttle flight. The pilot is Susan Still, who will be making her first flight and will be the second American woman to serve as a Shuttle pilot. There are three mission specialists on the flight. Janice Voss, making her third flight, is Mission Specialist-1 and is also the Payload Commander for STS-83. Mission Specialist-2 is Mike Gernhardt, making his second flight. Don Thomas is Mission Specialist-3 and is making his third flight. There are also two payload specialists serving on the STS-83 crew. Roger Crouch is Payload Specialist-1 and Greg Linteris is Payload Specialist-2. Both Crouch and Linteris are making their first space flight.

Columbia is targeted for launch on April 3 from NASA's Kennedy Space Center (KSC) Launch Complex 39-A at 2:01 p.m. EST at the opening of a 2 ½ hour available launch window. With an on-time launch on April 3 and a nominal 16-day mission, Columbia will land back at KSC on April 19 at about 7:30 a.m. EDT.

The primary focus for mission STS-83 is to conduct experiments and evaluate facilities associated with the Microgravity Science Laboratory-1 (MSL-1) payload. The MSL mission will serve as a bridge to America's future in space – the mission spanning the gap between the relatively short duration work done on today's Shuttle Spacelab flights to the long duration research that will be performed on the International Space Station.

MSL-1 will test some of the hardware, facilities and procedures that will be used on the International Space Station. It will introduce new procedures designed to place scientific payloads into orbit in a shorter amount of time than previously possible. The MSL flight will serve as a test-bed for new ways to conduct experiments in space -- helping to validate and improve that process. New methods of integrating experiments and equipment will be introduced, requiring new procedures at every step.

The STS-83 flight mirrors the future work aboard the Space Station in the international complexion of the flight. MSL-1 is bringing together academic, industrial and governmental partners from around the world. Scientists from four space agencies developed 33 investigations for the MSL-1 mission. Representatives of the European Space Agency, the German Space Agency and the National Space Development Agency of Japan are joining NASA and scientists throughout the United States in this research mission.

The STS-83 mission will introduce some new experiment facilities, designed to give scientists additional tools for finding answers in the microgravity of space. One such new component on MSL-1 is the innovative EXPRESS Rack, standing for "EXpedite the PRocessing of Experiments to the Space Station." It is designed for quick and easy installation of experiment and facility hardware on orbit and will provide the same structural and resource connections the rack will have on ISS.

Another advanced operational concept being tested on MSL-1 is the use of "expert" software systems. Designed to reduce the number of people now required to support ISS operations, the software packages will help human controllers provide rapid response to changes in mission operations.

The work performed on the MSL-1 flight has direct impact to life back on Earth. The protein crystals being grown on the flight may help scientists better understand the structure of various diseases and possible cures. The experiments designed to examine the combustion process which will help improve the design of more efficient, clean-burning combustion engines and shed light, as well, on issues of fire safety. The materials science investigations will help researchers understand how the structure of a material forms and how this structure affects the material's properties with implications from electronic materials, to the strength or resistance to corrosion of some materials, to how flaws in glasses and alloys can make them crack or break more easily.

STS-83 will be the 22nd Flight of Columbia and the 83rd mission flown since the start of the Space Shuttle program in April 1981.

MEDIA SERVICES INFORMATION

NASA Television Transmission

NASA Television is now available at a new satellite location. NASA TV is now available through the GE2 satellite system which is located on Transponder 9C, at 85 degrees west longitude, frequency 3880.0 MHz, audio 6.8 MHz.

The schedule for television transmissions from the orbiter and for mission briefings will be available during the mission at Kennedy Space Center, FL; Marshall Space Flight Center, Huntsville, AL; Dryden Flight Research Center, Edwards, CA; Johnson Space Center, Houston, TX; and NASA Headquarters, Washington, DC. The television schedule will be updated to reflect changes dictated by mission operations.

Status Reports

Status reports on countdown and mission progress, on-orbit activities and landing operations will be produced by the appropriate NASA newscenter.

Briefings

A mission press briefing schedule will be issued before launch. During the mission, status briefings by a flight director or mission operations representative and when appropriate, representatives from the payload team, will occur at least once each day. The updated NASA television schedule will indicate when mission briefings are planned.

Internet Information

Information on STS-83 is available through several sources on the Internet. The primary source for mission information is the NASA Shuttle Web, part of the World Wide Web. This site contains information on the crew and their mission and will be regularly updated with status reports, photos and video clips throughout the flight. The NASA Shuttle Web's address is:

http://shuttle.nasa.gov

If that address is busy or unavailable, Shuttle information is available through the Office of Space Flight Home Page:

http://www.osf.hq.nasa.gov/

General information on NASA and its programs is available through the NASA Home Page and the NASA Public Affairs Home Page:

http://www.nasa.gov

or http://www.gsfc.nasa.gov/hqpao/hqpao_home.html

Information on other current NASA activities is available through the Today@NASA page:

http://www.hq.nasa.gov/office/pao/NewsRoom/today.html

The NASA TV schedule is available from the NTV Home Page:

http://www.hq.nasa.gov/office/pao/ntv.html

Status reports, TV schedules and other information also are available from the NASA Headquarters FTP (File Transfer Protocol) server, ftp.hq.nasa.gov. Log in as anonymous and go to the directory /pub/pao. Users should log on with the user name "anonymous" (no quotes), then enter their E-mail address as the password. Within the /pub/pao directory there will be a "readme.txt" file explaining the directory structure:

* Pre-launch status reports (KSC): **ftp.hq.nasa.gov/pub/pao/statrpt/ksc**
* Mission status reports(JSC): **ftp.hq.nasa.gov/pub/pao/statrpt/jsc**
* Daily TV schedules: **ftp.hq.nasa.gov/pub/pao/statrpt/jsc/tvsked.**

NASA's Spacelink, a resource for educators, also provides mission information via the Internet. The system fully supports the following Internet services:

* World Wide Web: **http://spacelink.msfc.nasa.gov**
* Gopher: **spacelink.msfc.nasa.gov**
* Anonymous FTP: **spacelink.msfc.nasa.gov**
* Telnet : **spacelink.msfc.nasa.gov**

Spacelink's dial-up modem line is 205/895-0028.

Access by CompuServe

Users with CompuServe accounts can access NASA press releases by typing "GO NASA" (no quotes) and making a selection from the categories offered.

STS-83 QUICK LOOK

Launch Date/Site:	April 3, 1997/KSC Launch Pad 39-A
Launch Time:	2:01 P.M. EST
Launch Window:	2 hours, 30 minutes
Orbiter:	Columbia (OV-102), 22nd flight
Orbit Altitude/Inclination:	160 nautical miles, 28.45 degrees
Mission Duration:	15 days, 16 hours, 36 minutes
Landing Date:	April 19, 1997
Landing Time:	7:37 A.M. EDT
Primary Landing Site:	Kennedy Space Center, Florida
Abort Landing Sites:	Return to Launch Site - KSC Transoceanic Abort Sites - Ben Guerir, Morocco Moron, Spain Abort-Once Around - Edwards AFB, CA
Crew:	Jim Halsell, Commander (CDR), 3rd flight Susan Still, Pilot (PLT), 1st flight Janice Voss, Payload Commander, Mission Specialist-1 (MS-1), 3rd flight Mike Gernhardt, Mission Specialist-2 (MS-2), 2nd flight Don Thomas, Mission Specialist 3 (MS 3), 3rd flight Roger Crouch, Payload Specialist 1 (PS 1), 1st flight Greg Linteris, Payload Specialst 2, (PS 2), 1st flight
Spacelab Teams:	*Red Team*: Halsell, Still, Thomas, Linteris *Blue Team*: Voss, Gernhardt, Crouch
EVA Crewmembers: (if needed, contingency)	Mike Gernhardt (EV 1), Don Thomas (EV 2)
Cargo Bay Payloads:	MSL-1, CRYOFD, OARE
In-Cabin Payloads:	SAREX, MSX

CREW RESPONSIBILITIES

Payloads	Prime	Backup
MSL-1 Activation/Deact	Voss	Gernhardt
MSL-1 Science	Voss	Others
Secondary Experiments	Gernhardt	Halsell, Still
EVA (if needed)	Gernhardt (EV 1)	Thomas (EV 2)
Intravehicular Crewmember	Still	-----
Earth Observations	Still	Gernhardt
SAREX	Halsell	Gernhardt

DEVELOPMENT TEST OBJECTIVES

DTO 255: Wraparound DAP Flight Test Verification
DTO 312: External Tank TPS Performance
DTO 416: Water Spray Boiler Quick Restart Capability
DTO 667: Portable In-Flight Landing Operations Trainer
DTO 677: Evaluation of Microbial Capture Device in Microgravity
DTO 684: Radiation Measurement in Crew Compartment
DTO 805: Crosswind Landing Performance

DETAILED SUPPLEMENTARY OBJECTIVES

DSO 331: Integration of the Space Shuttle Launch and Entry Suit
DSO 487: Immunological Assessment of Crewmembers
DSO 493: Monitoring Latent Virus Reactivation and Shedding in Astronauts
RME 1309: In-Suit Doppler Ultrasound for Determining the Risk of Decompression Sickness during Extravehicular Activities

RISK MITIGATION EXPERIMENTS

RME 1330: Wireless Data Acquisition System

PAYLOAD AND VEHICLE WEIGHTS

Vehicle/Payload	Pounds
Orbiter (Columbia) empty and 3 SSME's	187,634
Shuttle System at SRB Ignition	4,522,854
Orbiter Weight at Landing with Cargo	259,705
MSL-1 Spacelab Module	22,418
CRYOFD	763
OARE	252

MISSION SUMMARY TIMELINE

Flight Day One:
Launch/Ascent
OMS-2 Burn
Payload Bay Door Opening
Spacelab Activation
MSL-1 Science Operations

Flight Day 2-14:
MSL-1 Science Operations

Flight Day 15:
MSL-1 Science Operations
Crew News Conference

Flight Day 16:
MSL-1 Science Operations
Flight Control System Checkout
Reaction Control System Hot-Fire
Cabin Stow
Spacelab Deactivation

Flight Day 17:
Deorbit Preparation
Payload Bay Door Closing
Deorbit Burn
KSC Landing

SHUTTLE ABORT MODES

Space Shuttle launch abort philosophy aims toward safe and intact recovery of the flight crew, Orbiter and its payload. Abort modes for STS-82 include:

* Abort-To-Orbit (ATO) -- Partial loss of main engine thrust late enough to permit reaching a minimal 105-nautical mile orbit with the orbital maneuvering system engines.

* Abort-Once-Around (AOA) -- Earlier main engine shutdown with the capability to allow one orbit of the Earth before landing at the Kennedy Space Center, FL.

* Transoceanic Abort Landing (TAL) -- Loss of one or more main engines midway through powered flight would force a landing at either Ben Guerir, Morocco; or Moron, Spain.

* Return-To-Launch-Site (RTLS) -- Early shutdown of one or more engines, and without enough energy to reach a TAL site, would result in a pitch around and thrust back toward Kennedy until within gliding distance.

MICROGRAVITY SCIENCE LABORATORY-1 (MSL-1)

The first Microgravity Science Laboratory mission (MSL-1) is the bridge to America's future in space -- the mission spanning the gap between today's Spacelab and tomorrow's International Space Station.

MSL-1 will connect the foundations of American space exploration and discovery, laid by the Apollo, Skylab and Spacelab programs, to the Space Station.

Using Spacelab as a test-bed, MSL-1 will test some of the hardware, facilities and procedures that will be used on the International Space Station.

MSL-1 incorporates new and existing facilities to expand previous research -- and begin exploration in new directions.

With its primary goal as an orbiting laboratory for long-term research in microgravity, MSL-1 will introduce new procedures designed to place scientific payloads into orbit in a shorter amount of time than previously possible. It will serve as a test-bed for new ways to conduct experiments in space -- helping to validate and improve that process. New methods of integrating experiments and equipment will be introduced, requiring new procedures at every step.

Bringing together international academic, industrial and governmental partners in a venture that will model future operations, MSL-1 builds on past cooperative and scientific foundations. Those include the International Microgravity Laboratory missions, the U.S. Microgravity Laboratory missions, Spacelab J and the German Spacelab missions.

By thoroughly testing these new procedures, hardware, and systems, MSL-1 will help ensure that Space Station research has the best start possible. The information and samples from the mission's scientific investigations also will ensure mature, long-term research in microgravity.

MSL-1 Science

Scientists from four space agencies developed 33 investigations for the MSL-1 mission. Representatives of the European Space Agency, the German Space Agency and the National Space Development Agency of Japan are joining NASA and scientists throughout the United States in this mission of discovery.

The crew will conduct these experiments inside Spacelab, a versatile research laboratory which fits in the Space Shuttle cargo bay. With its extra work area, power supplies, information management capability and versatile equipment racks, scientists in space can work much as they would in their laboratories on Earth.

Many MSL-1 experiments owe their heritage to earlier Skylab, sounding rocket and ground-based experiments. Some experiments have evolved over several Spacelab missions. Some flown on previous flights are being flown again to probe new scientific questions or further explore prior studies.

Experiment Facilities

This mission will introduce some new experiment facilities, designed to give scientists additional tools for finding answers in the microgravity of space.

A new, key component on MSL-1 is the innovative EXPRESS Rack, standing for "EXpedite the PRocessing of Experiments to the Space Station." It is designed for quick and easy installation of experiment and facility hardware on orbit.

On MSL-1, the EXPRESS Rack will replace a Spacelab double rack, and special hardware will provide the same structural and resource connections the rack will have on Space Station. Two payloads -- the Physics of Hard Spheres experiment and the Astro/Plant Generic Bioprocessing Apparatus experiment -- will be flown to check the design, development and adaptation of the EXPRESS Rack hardware.

Another advanced operational concept being tested on MSL-1 is the use of "expert" software systems. Designed to reduce the number of people now required to support Space Station operations, the software packages will help human controllers provide rapid response to changes in mission operations. If there is an unscheduled event during a mission, the system will provide immediate information about its impact on the operation of each experiment.

Conducting Science in Microgravity

The microgravity environment of the orbiting Space Shuttle provides unique opportunities to researchers.

Subtle and complex phenomena, normally hidden by the stronger force of gravity, can be revealed for detailed study. Mixtures that separate on Earth because of the different densities of their components can be mixed evenly and processed in microgravity. This allows scientists to study the processing of such materials and possibly to create advanced materials for study and comparison.

The growth of near-perfect protein crystals will enhance our understanding of protein molecular structures and may speed the development of improved drugs.

Also, scientists can use the microgravity environment of space to learn how the presence or absence of gravity affects living organisms. This will aid long-term space efforts and provide a better understanding of life on Earth by allowing scientists to study biological processes and phenomena impossible to study in gravity.

Protein Crystallography

Science has gained a better understanding of various diseases through research known as protein crystallography. Proteins are essential components of all living cells and serve many different functions. By studying a protein that is part of a virus, researchers can learn how that virus attacks plants or animals.

To determine the exact structure of a selected protein, scientists must grow near-perfect crystals of that protein. While some proteins can be crystallized easily on Earth, gravity works against the formation of perfect crystals of any substance. By growing protein crystals in microgravity, investigators can get significantly closer to the ideal of perfection.

Three protein crystal growth experiments are scheduled for MSL-1. The Protein Crystal Growth Using the Protein Crystallization Apparatus for Microgravity experiment will grow large quantities of various proteins. The Protein Crystal Growth Using the Second Generation Vapor Diffusion Apparatus experiment will grow high-quality crystals of various proteins using the alternate method known as vapor diffusion. The Protein Crystal Growth Using the Hand-Held Diffusion Test Cells experiment will grow crystals to investigate differences in the processes in microgravity from those on Earth and to refine the cell design for the Observable Protein Crystal Growth Apparatus.

Combustion Science

Combustion -- the more scientific term for burning -- plays a key role in processes involved in ground transportation, spacecraft and aircraft propulsion, and hazardous waste disposal. Yet, despite years of study, there is only a limited understanding of many fundamental combustion processes because Earth's gravity limits studies -- again, by masking many subtle phenomena.

The microgravity environment of space, however, allows scientists to expand the scale and duration of experiments and to study details hidden on Earth.

The MSL-1 mission will support three combustion investigations. The Laminar Soot Processes experiment will explore the properties and processes of soot and flames. The Structure of Flame Balls at Low Lewis-number experiment will try to determine if stable "flame balls" can exist. The Droplet Combustion Experiment will study the processes and phenomena associated with combustion in spherical fuel droplets.

Results from these experiments will improve understanding of how fundamental combustion phenomena are affected by gravity; advance combustion science and technology on Earth -- including the improved design of more efficient, clean-burning combustion engines; and shed light, as well, on issues of fire safety in space.

Materials Science

The key to materials science research is understanding how the structure of a material forms and how this structure affects the material's properties.

On Earth, sedimentation and buoyancy cause uneven mixing of a material's ingredients and can deform the structure as it solidifies. These gravity-induced imperfections limit the usefulness of many electronic materials. Imperfections in the structures of metals and alloys can affect mechanical strength or resistance to corrosion, while similar flaws in glasses and alloys can make them crack or break more easily. Gravity also affects the internal structure of polymers, long chains of organic molecules that form the basis of a range of products from nylon to plastic.

In microgravity, sedimentation and buoyancy are reduced or eliminated, allowing scientists to study the process of material formation in ways never before possible. Minute forces and phenomena that are overwhelmed by gravity on Earth can be observed and studied. Physical and chemical conditions present during processing can be controlled and changed, enabling investigators to learn how these factors affect the final structure of the material.

MSL-1 will feature 19 materials science investigations in three major facilities. These facilities are the Large Isothermal Furnace, the EXPRESS Rack and the Electromagnetic Containerless Processing Facility.

Additional technology demonstrations and experiments will be performed in the Middeck Glovebox facility.

The knowledge gained from these studies will benefit future microgravity research and material processing efforts and also will be used to improve materials processing on Earth.

Mission Operations

The Marshall Space Flight Center in Huntsville, Ala., manages MSL-1 as NASA's lead center for microgravity research.

Experiment operations for the 16-day flight will be directed from the Spacelab Mission Operations Control center at Marshall.

During the mission, scientists and engineers representing many MSL-1 experiments will work in Marshall's Science Operations Area. There, they will monitor experiments by video and voice links with the Shuttle, send remote commands to their instruments, discuss operations with the MSL-1 crew, and coordinate mission activities with members of other experiment teams.

The teams will be backed by colleagues working at remote sites for science operations and support.

Remote operations have been an important part of previous Spacelab missions. But MSL-1 will refine their operation, while making use of previous hardware and facilities. MSL-1 will have new remote operations in Tsukuba, Japan, as well as sites at Lewis Research Center in Cleveland, Ohio; and the University of Colorado at Denver. Also, a remote site -- distinct from the Spacelab Mission Operations Control facility -- will be operational at Marshall for the Glovebox experiments. Additional science teams will be located at the Johnson Space Center in Houston, Texas, and the Kennedy Space Center in Florida.

Primary responsibility for operating the experiments in orbit belongs to the Spacelab science crew. Payload Commander Janice E. Voss, Mission Specialists Donald A. Thomas and Michael L. Gernhardt, and Payload Specialists Roger K. Crouch and Gregory Linteris will work in two 12-hour shifts. Operating Spacelab 24 hours a day enables scientists to obtain the most from valuable time in orbit. The crew will work from a pre-planned master timeline, with adjustments allowed for unexpected opportunities.

After landing, many experiment samples -- some with limited lifetimes -- will be returned to the scientists for evaluation.

Later, experiment hardware will be returned to the space agency that developed it. And computer tapes, voice recordings, video tapes and other information collected in the experiments will be organized and forwarded to investigators. Analysis of the results will start even before the Shuttle returns to Earth, and may continue for several years.

The investigators will be rewarded with new insights into the intrinsic properties of materials and increased knowledge of how gravity affects living systems on Earth. And MSL-1 will certainly provide new questions for scientists and engineers seeking additional answers in the unique laboratory of space.

COMBUSTION MODULE-1

Combustion Module-1 was developed by NASA to test hardware and experiment approaches on Spacelab. The module can accommodate a variety of combustion experiments through the use of experiment-unique chamber inserts called Experiment Mounting Structures.

It requires two Spacelab racks--one double and one single-- with a combined weight of 1,600 pounds.

Housed in the double rack is the Experiment Package. The package contains a 24 gallon combustion chamber, a gas chromatograph, seven cameras, the experiments' computers and support equipment.

The combustion chamber has slide rails and can be quickly disconnected, allowing the crew to insert and connect the Experiment Mounting Structures.

The single rack contains the Fluid Supply Package and the Video Cassette Recorder Package. The Fluid Package consists of 20 bottled gases and supplies gas for combustion, combustion chamber purges, soot sampling, chemical diagnostics, on-orbit leak tests and pure air in the combustion chamber for science and crew access.

Combustion Module-1 will support two investigations during the mission.

Experiment: Laminar Soot Processes
Facility: Combustion Module 1
PI: Dr. Gerard Faeth, University of Michigan in Ann Arbor.

Laminar jet diffusion flames involve the combustion of a hydrocarbon fuel in still air. They are similar to candle flames except that the fuel is supplied by a gas jet rather than by evaporation from a wick. The shape of a laminar jet diffusion flame approximates combustion processes in many practical devices, such as diesel engines, aircraft jet engines and furnaces. Information will be collected on flame shape, the type and amount of soot produced under various conditions and the temperature of soot components. This experiment could lead to ways to contain unwanted fires, and also limit the number of fatalities from carbon monoxide emissions. Scientists also hope to use information learned from the experiment to improve theoretical models of combustion.

Experiment: Structure of Flame Balls at Low Lewis-number (SOFBALL)
Facility: Combustion Module-1
PI: Dr. Paul Ronney, University of Southern California in Los Angeles

The purpose of the investigation is to determine if stable balls of flame can exist. If proven they can, additional studies may determine if radiative loss is the stabilizing mechanism and how mixture properties affect flame balls. Information gained from this experiment could lead to improvements in lean-burn internal combustion engines, to increase efficiency and reduce emissions. Other benefits may include improved fire safety for mine shafts, chemical plants and spacecraft.

DROPLET COMBUSTION APPARATUS

The Droplet Combustion Apparatus is an enclosed chamber in which one investigation, the Droplet Combustion Experiment, will process during MSL-1.

Experiment: Droplet Combustion Experiment
Facility: Droplet Combustion Apparatus
PI: Dr. Forman Williams, University of California at San Diego

The purpose of the experiment is to collect information on burning rates of flames, flame structures and conditions when extinguishing a flame. Combustion of fuel droplets is an important element in heating furnaces for materials processing, heating homes and businesses, producing power by gas turbines, as well as combustion of gasoline in vehicle engines. With improved understanding of droplet combustion, the results of this experiment could lead to cleaner and safer ways to burn fossil fuels, and more efficient methods of generating heat and power on Earth.

Experiment: Fiber-Supported Droplet Combustion
Facility: Middeck Glove Box
PI: Dr. Forman Williams, University of California at San Diego

The purpose of the experiment is to study how fuels burn and test a new technique of droplet deployment and ignition using thin fibers for positioning. The fiber-supported droplet combustion technique will allow researchers to study fundamental combustion processes, such as how pollutants are formed. The mechanisms that cause the production of soot in flames are among the most important unresolved problems of combustion science because soot affects life on Earth in many ways. Knowledge gained from this experiment could be applied to increased efficiency in the utilization of fossil fuels and to further the understanding of combustion byproducts such as soot and smog.

PROTEIN CRYSTAL GROWTH

Each cell in a living organism contains thousands of different proteins the substances which play essential roles in the maintenance of life. Protein crystals are used in basic biological research, pharmacology and drug development. However, the structures of many important proteins remain a mystery simply because researchers are unable to obtain crystals of sufficient quality or size. Earth's gravity affects the purity and structural integrity of crystals. The low gravity environment in space allows for the growth of larger, purer crystals of greater structural integrity. In some cases, the analysis of protein crystals grown in space has revealed more about a protein's molecular structure than has been possible even after years of effort with crystals grown on Earth. Three protein crystal growth studies will be conducted on MSL-1.

Experiment: Protein Crystallization Apparatus for Microgravity
PI: Dr. Dan Carter of New Century Pharmaceuticals in Huntsville, Ala.

Facility: The Protein Crystallization Apparatus for Microgravity consists of small plastic trays with seven sample wells surrounded by donut-shaped reservoirs. The complete crystallization apparatus comprises nine trays (63 specimens) carried in a cylinder with a crank mechanism.

MSL-1 will carry six cylinders in a Single-locker Thermal Enclosure System and another six in cabin-temperature locker, for a total of 756 specimens.

Experiment: Second-Generation Vapor Diffusion Apparatus
PI: Dr. Larry Delucas of the Center for Macromolecular Crystallography at the University of Alabama in Birmingham.

Facility: This facility will use vapor diffusion techniques to process eleven different proteins in 80 crystallization chambers. These experiments in protein crystallization research include efforts to obtain detailed structural data on two proteins that relate to Chagas' disease, a debilitating and deadly disease that effects more than 20 million people in Latin America and parts of the United States. This work is in collaboration with an Investigators' Working Group currently comprised of Argentina, Brazil, Chile, Costa Rica, Mexico, Uruguay and the United States as part of a larger effort to help control communicable diseases.

Experiment: Handheld Diffusion Test Cells
PI: Dr. Alexander McPherson of the University of California, Riverside.

Facility: A single unit of the Hand-Held Diffusion Test Cells experiment consists of eight cells mounted on a rail and contained in a protective enclosure. Each test cell has three chambers containing a protein solution, a buffer solution and a precipitant solution chamber. Using the liquid-liquid diffusion method the different fluids are brought into contact but not mixed. Over time, the fluids will diffuse into each other through the random motion of molecules. The gradual increase in concentration of the precipitant within the protein solution causes the proteins to crystallize. A total of 32 specimens will be flown on MSL-1, and results will be used to refine the design of an Observable Protein Crystal Growth Apparatus being designed for later missions

EXPRESS RACK

The EXPRESS Rack is designed to simplify and speed the process of housing, transporting, installing and operating Space Station experiments. Officially called Expedite the Processing of Experiments to the International Space Station, the EXPRESS rack complies with established standards of Space Station hardware.

Developed by NASA's Life Sciences division, the rack contains 10 compartments for housing experiments -- eight smaller compartments called lockers and two larger, standardized compartments called drawers.

During the Microgravity Science Laboratory mission, two experiments will be conducted in the EXPRESS Rack to test and demonstrate the hardware.

The Physics of Hard Spheres Experiment will be transported into orbit in the EXPRESS Rack. It will be housed in four lockers and one drawer of the facility, demonstrating the rack's capability to accommodate smaller, standardized experiments.

The Astro/Plant Generic Bioprocessing Apparatus will be carried into orbit in the Shuttle's middeck and transferred to the EXPRESS Rack once in orbit. The apparatus will be returned to the middeck following the experiment run. This will demonstrate the ease and speed of installing and removing an EXPRESS Rack experiment, a process which will be used to transfer experiments to and from the International Space Station.

Physics of Hard Spheres Experiment
Dr. Paul Chaikin, Princeton University, Princeton, N.J.

Objective: The experiment will examine the changes which occur during the transition of a substances from liquids to solids and solids to liquids. These transitions are fundamental to materials processing. A better understanding of liquid-to-solid and solid-to-liquid transitional phases may result in the improved design of metallic alloys and processing techniques.

The investigation will examine seven, three-component samples of varying concentrations. The samples, contained in glass spheres, will be colloidal systems -- a colloid dispersed in a gas, liquid or solid. A colloidal substance consists of very small particles which will remain suspended in a medium, do not dissolve in it, and will diffract light. Using a Light Scattering Instrument, measurements of diffracted light from the small particles of the colloids will be obtained as varying degrees of force -- produced by a laser in the Light Scattering Instrument -- are applied to the samples.

Astro/Plant Generic Bioprocessing Apparatus (AstroPGBA)
Dr. Louis Stodieck, University of Colorado, Boulder, Colo.

Objective: This experiment will study the effect of space on certain species of plants. Specifically, it will investigate the production of lignin – essential for the formation and joining of woody cell walls in plants; the production of secondary metabolites -- essential to generating energy needed to sustain vital life processes; and changes which occur in the sugars and starches of vegetable plants. From this investigation, researchers hope to determine if these processes are interrelated and how they may be manipulated to improve plant growth and production on Earth. Researchers also hope the study will verify evidence that plants grown in microgravity require less metabolic energy to produce lignin, permitting greater production of secondary metabolites, a source of many medicinal drugs. Secondary metabolites may also serve to attract, repel or poison insects.

Plants to be studied include Artemisia annua, a species of sage native to Southeast Asia and a source of the antimalarial drug artemisinin; Catharanthus roseus, which produces vinca alkaloids, used in chemotherapy treatment of cancer; Pinus taeda (loblolly pine), used widely in the paper and lumber industries; and Spinacia oleracea, a variety of spinach.

LARGE ISOTHERMAL FURNACE

The Large Isothermal Furnace is a facility capable of uniformly heating large samples of metal alloys to 2912 degrees Farhenheit (1,600 degrees Celsius) and rapidly cooling samples using a flow of helium. A vacuum-heating facility, the furnace consists of a sample container and heating element surrounded by a vacuum chamber.

The furnace will be used to study the diffusion of liquid metals -- the process by which liquid metals mix when heated. This process cannot adequately be studied on Earth because of convection.

The first, convection, is the transfer of heat caused by the movement of fluid particles which results from a variation in concentration and gravity. On Earth, liquids will gradually mix as a result of heat and stirring generated by convection. To study the effect of an outside source of heat and stirring on the mixing process, it is necessary to reduce or eliminate convection.

In the near-zero gravity aboard the orbiting Space Shuttle, researchers are able to study the diffusion process unaffected by convection. The experiments may provide a better understanding of how liquid metals mix, a process vital to the production of high quality metal alloys and products.

Measurement of Diffusion Coefficient by Shear Cell Method

Dr. Shinichi Yoda, National Space Development Agency of Japan (NASDA), Tsukuba, Japan

Objective: This experiment will test the shear cell cartridge, or container, to be used in two investigations conducted in the Large Isothermal Furnace. The cartridge is specifically designed for these two studies which will use the shear cell method to determine the diffusion coefficient -- or an accurate measurement for the fundamental variables which regulate diffusion.

This method involves two column samples of different concentrations. The columns are melted, then rotated into contact with each other for a specific period of time. The resulting single column is sheared into segments and cooled before measurements are taken.

Using the shear cell method, this study may also reveal the rate of diffusion of tin and lead-tin-telluride. Findings may lead to a better understanding of the diffusion process and improved metal alloys and products.

Diffusion of Liquid Metals
Dr. Toshio Itami, Hokkaido University, Sapporo, Japan

Objective: The study is designed to establish an accurate measurement for the fundamental variables which regulate diffusion of liquid tin relative to temperature. On Earth, diffusion experiments conducted at high temperatures have been unsuccessful due to convection, or fluid movement caused by gravity. This experiment may help researchers more clearly define the diffusion process and could lead to improved designs of metallic alloys and processing techniques on Earth.

Diffusion in Liquid Lead-Tin-Telluride
Ms. Misako Uchida, Ishikawajima-Harima Heavy Industries, Tokyo, Japan

Objective: Researchers hope to establish an accurate measurement for the diffusion coefficient of liquid lead-tin-telluride in relative to temperature. On Earth, it is difficult to achieve an equal distribution of particles in this metal mixture as the mixture solidifies. As with other liquid metals, the diffusion process is masked by gravity's influence on the movement of liquid particles. It also appears that diffusion's dependence on temperature is different in microgravity, or near-zero gravity. Lead-tin-telluride holds potential as a material for use in infrared detectors and lasers.

Impurity Diffusion in Ionic Metals
Dr. Tsutomu Yamamura, Tohoku University, Sendai, Japan

Objective: The objective of the study is to determine an accurate measurement for the diffusion coefficient of a tracer, or impurity, in molten salts. Conducting the study in the microgravity environment of the Space Shuttle will eliminate convection, or fluid movement caused by gravity. On Earth, convection disturbs the diffusion process, resulting in inconsistent measurements.

In addition, the study is designed to reveal ideal conditions for electrolysis of molten salts. Electrolysis is the use of an electrical current to break down a dissolved substance into its constituent components.

The experiment may provide needed information to improve the diffusion process. An accurate measurement for the diffusion coefficient in molten salts would also be useful in basic science and engineering work.

Liquid Phase Sintering II
Dr. Randall German, Pennsylvania State University, University Park, Penn.

Objective: The investigation will test theories of liquid-phase sintering -- to heat and liquefy materials to form a mixture without reaching the melting point of the solid phase material. Specifically, the study will examine the coalescence, or mixing together, of materials during liquid-phase sintering. The investigation will also look at changes that occur in the materials' pores which allow the mixing of fluids during liquid-phase sintering. Information gathered will be compared with theoretical predictions in hopes of improving theoretical models and developing a better understanding of sintering in microgravity.

Diffusion Processes in Molten Semiconductors
Dr. David N. Matthiesen, Case Western Reserve University, Cleveland, Ohio

Objective: The experiment is designed to determine an the diffusion coefficient relative to temperature, impurities and diameter of the sample. Specifically, researchers hope to establish an accurate measurement for the fundamental variables which regulate the diffusion of tracers, or impurities, of gallium, silicon and antimony in melted germanium. On Earth, the movement of tracers during the processing of semiconductors or other materials results from a combination of diffusion and gravity-generated convection, or fluid movement caused by gravity. Since diffusion and convection cannot be separated on Earth, scientists have not been able to accurately measure the diffusion coefficient. This research is aimed at developing better models of diffusion.

MEASURING MICROGRAVITY

Space Acceleration Measurement System (SAMS)
Project Scientist: Dr. Peter Tschen, NASA Lewis Research Center, Cleveland, Ohio

Objective: The effects of Earth's gravity on the Space Shuttle and its cargo are markedly reduced when in orbit. But so strong are the forces of gravity, the effects are never completely eliminated. Disturbances occur when crew members move about the Shuttle, when onboard equipment is operated, or thrusters are fired to maneuver the Shuttle to its proper position. Even slight, atmospheric drag on the Shuttle can create disturbances that mimic gravity. Such minute changes in the orbital environment of the Shuttle can effect sensitive experiments being conducted onboard. Researchers and scientists conducting experiments on the Microgravity Science Laboratory mission will depend on the Space Acceleration Measurement System to record precise measurements of such changes. The system will enable them to adjust their experiments and improve the collection of scientific information during the mission. The system's measurements also aid in determining how vibrations or accelerations affect the results of experiments.

System Operation: The system accurately measures and maps the acceleration environment in orbit, using three remote sensor heads mounted in different locations. Each sensor head has three accelerometers oriented to enable the detection of accelerations three-dimensionally, in the range of .01- to 100-Hertz. For this mission, one sensor head will detect accelerations up to 2.5 Hertz, while others can detect accelerations up to 25 Hertz.

Information collected by the sensors is transmitted to the ground through the Shuttle's communications system. This allows scientists to make immediate assessments of the effects of the microgravity environment, and make necessary corrections for their experiments.

Quasi-Steady Acceleration Measurement (QSAM)

Project Scientist: Dr. Hans Hamacher, German Aerospace Research Establishment (DLR)

Objective: Researchers who conduct scientific experiments in the microgravity environment of space require as few disturbances as possible. But even the near-vacuum of space has some forces of gravity and vibration.Among the disturbances encountered on a Space Shuttle mission are rapidly changing movements by the crew or periodic equipment operations. And steady accelerations -- changes in velocity -- such as a slight pull on the Shuttle created by atmospheric drag, also create disturbances making it impossible to achieve complete zero-gravity conditions.

Different experiments conducted in space are sensitive to different types of accelerations. To accurately interpret the results of their experiments, researchers need to know the precise level of accelerations that occur at all times during their experiments.

The Quasi-Steady Acceleration Measurement (QSAM) experiment is primarily designed to detect steady, very low-frequency, residual accelerations between 0 and 0.02 Hertz, or cycles per second.

System Operation: Low-frequency accelerations affect various physical processes more than higher-frequency accelerations. By means of a unique design of its sensor heads, the Quasi-Steady Acceleration Measurement experiment is able to make precise measurements of this important acceleration range.

This system complements three others that are measuring disturbances on the Microgravity Science Laboratory mission. Together, the four systems provide detection of the entire range of accelerations that may affect experiments.

Orbital Acceleration Research Experiment (OARE)
Project Scientist: Dr. Peter Tschen, NASA Lewis Research Center, Cleveland, Ohio

Objective: There is no line -- no hard boundary -- between Earth's atmosphere and space. At the Earth's surface, the atmosphere is thickest, and it gradually thins with increasing elevation. Even altitudes reached by the Space Shuttle are not completely without air. The Shuttle travels very rapidly through this tenuous, near-vacuum atmosphere. But the Shuttle is slightly slowed, or decelerated, by friction with the gas molecules. And because the density of the atmosphere changes from day to night, the amount of friction varies proportionally.

The Orbital Acceleration Research Experiment (OARE) makes extremely accurate measurements of these variations and other disturbances, using a sensor called an accelerometer, and records them for later analysis. Analysis of these and other types of microgravity disturbances enables researchers to assess the influence of Shuttle accelerations on the scientific experiments carried onboard the Microgravity Science Laboratory.

System Operation: The Orbital Acceleration Research Experiment is a self-calibrating instrument that monitors and records extremely small accelerations -- changes in velocity -- and vibrations that are experienced during orbit of the Shuttle. At the heart of the instrument is a miniature electrostatic accelerometer that precisely measures low-frequency, on-orbit acceleration disturbances. The OARE is capable of sensing and recording accelerations on the order of one-billionth the acceleration of Earth's gravity -- 1 nano-g -- at a frequency of less than 1 Hertz, or once per second.

The instrument's principal purpose is to help determine the orientation of the least acceleration disturbance for the Shuttle orbiter during flight. Information is collected and measured by the instrument. Then it is processed, stored and transmitted in near real-time to scientists on Earth. Based on this information, the Shuttle's flight attitude can be adjusted to satisfy the needs of any particular experiment.

Microgravity Measurement Assembly (MMA)
Project Scientist: Dr. Hans Hamacher, German Aerospace Research Establishment (DLR)

Objective: Many experiments onboard the Microgravity Science Laboratory require a very smooth ride through space so that their delicate operations are not disturbed. Yet even in the quiet, low-gravity environment of space, disruptions occur from movements by the crew, equipment operations and occasional firing of thrusters to adjust the orbital position of the Shuttle.

One of the systems developed to measure disruptions to experiments caused by accelerations is the Microgravity Measurement Assembly (MMA).

System Operation: The Microgravity Measurement Assembly determines both high- and low-frequency spacecraft disturbances, collecting measurements from seven sensor heads placed at selected locations in the Spacelab. Four of the sensor heads are placed in the Spacelab experiment racks, where many of the gravity-sensitive investigations are located. Most of the MMA sensors can detect accelerations in the range of 0.1- to 100-Hertz. One sensor, called the Accelerometre Spatial Triaxial Electrostatique, can measure accelerations below 1.0 Hertz.

Information collected from the sensors is sent to the instrument's central computer. It can be transmitted in real-time to researchers on the ground, where they can promptly assess measurements of the microgravity environment vs. the requirements for various experiments. From this, plans can be made for possible corrective actions for particular experiments.

TEMPUS

Electromagnetic Containerless Processing Facility (German: Tiegelfreies Elektromagnetisches Prozessieren Unter Schwerelosigkeit, or TEMPUS.)
Hardware Developer:
Wolfgang Dreier, German Space Agency (DARA)

Project Scientists: Dr. Ivan Egry, German Aerospace Research Establishment (DLR), Cologne, Germany and Dr. Jan Rogers, NASA Marshall Space Flight Center, Huntsville, Ala.

The Electromagnetic Containerless Processing Facility -- referred to by its German acronym TEMPUS -- was developed by the German Space Agency. It is an electromagnetic levitation facility that allows scientists on the ground to process metallic samples in a containerless microgravity environment.TEMPUS uses a combination of an electromagnetic field and the microgravity environment to suspend metal alloys in free space within a set of coils so the alloys may be melted and resolidified in an ultra-pure environment. By levitating the sample within the coils, researchers can study the alloy's solidification while ensuring the sample does not touch any container's walls. The facility records information on the alloys while they are molten as they solidify.

The TEMPUS facility first flew on the second International Microgravity Laboratory (IML-2), a Shuttle and Spacelab mission in July 1994.

Electromagnetic levitation is commonly used in ground-based experiments to melt and then cool metallic substances below their "freezing" points while preventing solidification from occurring. The process of cooling metallic melts below their normal freezing points without solidification is termed "undercooling." The ability of very pure liquid alloys, in a microgravity environment, to remain liquid at hundreds of degrees below their normal solidification points is due to the absence of contact with other materials.

During the MSL-1 mission, scientists will perform experiments which build upon those conducted during IML-2, studying various thermodynamic and kinetic properties of 18 samples. For each investigation, a small spherical sample, about 5/16 inch round (7-8 mm), will be positioned by the electromagnetic coil, melted, and then cooled. Melting points of the samples range between 1,400-3,362 F (760-1,850 C), with the maximum sample temperature about 3,812 F (2,100 C).

A key phenomenon to be studies is nucleation. This is the initial stage of crystalline solidification, when small, isolated clusters of atoms begin arranging themselves into a regular, repeating structure. Atoms fall into place on these clusters, or nuclei, causing the sites to grow until the entire mass becomes solid.

The TEMPUS system provides the means for physically manipulating samples during processing. Rotations and oscillations can be controlled through the application of an electromagnetic field. Nucleation can be initiated at any desired undercooled temperature by inserting a needle into the sample, causing the entire sample to rapidly solidify. Also, the sample can be squeezed by applying short power pulses to the heating or levitation coils. By observing how the sample reacts, properties such as surface tension and viscosity can be determined.

Experiment: Thermophysical Properties of Undercooled Metallic Melts
Facility: Electromagnetic Containerless Processing Facility (TEMPUS)
Principal Investigator: Dr. Ivan Egry, DLR.
Co-Investigators: Dr. Georg Lohoefer, DLR; Dr. Berndt Feuerbacher, DLR.

To measure surface tension, viscosity, and electrical conductivity of liquid and undercooled alloys, specifically palladium-copper-silicon and cobalt-palladium. This experiment will provide information about the heat transfer properties of undercooled metallic melts. Findings from this study will complement existing information on liquid metals at and above the melting point, providing insight into the largely unexplored state where an undercooled liquid begins to solidify.

Experiment: Thermophysical Properties of Advanced Materials in the Undercooled Liquid State
Facility: TEMPUS
Principal Investigator: Dr. Hans F. Fecht, Technical University Berlin, Germany.
Co-Investigator: Dr. Rainer Wunderlich, Technical University Berlin.

This experiment will measure the heating properties of undercooled metallic substances to help researchers further understand how metallic glass forms in zirconium-based alloys. Comparisons between different alloys should indicate how the glass-forming ability of an alloy is related to its composition. Understanding the fundamentals of undercooling and formation of metallic glasses is vital for designing such materials. They may find applications in many technological areas because of their unique mechanical and physical properties. Some present areas of application include high-powered laser choke switches, transformer cores, brazing alloys, wear-resistant coatings and reinforcing fibers in metal matrices. In the future, these injection-molded, bulk metallic glasses could influence the state of materials science and engineering.

Experiment: Measurements of the Surface Tension of Liquid and Undercooled Metallic Melts by Oscillating Drop Technique
Experiment Facility: TEMPUS
Principal Investigator: Dr. Martin G. Frohberg, Technical University Berlin, Germany.
Co-Investigator: Dr. Michael Roesner-Kuhn, Technical University Berlin.

This experiment studies the surface tension of liquid metal drops, which are levitated and positioned in an electromagnetic field. The physical property of surface tension results from the forces of mutual attraction of the molecules making up a liquid. These forces cause the molecules at the drop's outer surface to be pulled inward. The approximately spherical shape of rain drops, for example, is a result of surface tension. The strength of the force working on the rain drop or any other liquid sample depends on the temperature and purity of the liquid. Scientists currently do not have sufficient data about concentration- and temperature-dependent surface tensions of liquid, and especially undercooled liquid, materials. Industrial processes which may benefit from findings include: metal-gas-slag reactions, filtration of melts, hot sintering of metallic powders, reactions between melts and refractories, solidification processes, and material flow in the interface between two different liquids.

Experiment: Study of the Morphological Stability of Growing Dendrites by Comparative Dendrite Velocity Measurements on Pure Ni and a Dilute Ni-C Alloy in the Earth and Space Laboratory
Experiment Facility: TEMPUS
Principal Investigator: Dr. D. M. Herlach, DLR.
Co-Investigator: Dr. M. Barth, DLR; Dr. B. Feuerbacher, DLR.

This experiment deals with the investigation of the dendritic solidification velocity resulting from small levels of melt undercooling. Dendrites -- from the Greek word for "tree" -- are tiny branching structures that form inside molten metal alloys when they solidify during manufacturing. The size, shape and structure of the dendrites have a major effect on the strength, ductility and usefulness of an alloy. Measurements of the speed of dendritic solidification can be used to test and refine modeling of dendritic growth behavior. This type of experiment must be performed in microgravity because crystal growth can be greatly affected by convective fluid flow, or buoyancy-driven motion, in molten metal. The low-acceleration environment in space effectively eliminates convection. Comparing space experiment data to those obtained on Earth will allow researchers to learn more about the effect convection has on dendrite growth. Information gained from this experiment could have significance in many manufacturing processes, such as welding and casting.

Experiment: Undercooled Melts of Alloys with Polytetrahedral Short-Range Order
Experiment Facility: TEMPUS
Principal Investigator: Dr. D.M. Herlach, DLR
Co-Investigator: Dr. Dirk Holland-Moritz, DLR; Dr. Heinrich Bach, University of Bochum, Germany; Dr. Hans Fecht, Technical University Berlin; Dr. Kenneth Kelton, Washington University, St. Louis; Dr. Berndt Feuerbacher, DLR.

The experiment will investigate the recently discovered and fascinating subject of quasicrystals. The quasicrystalline state, discovered in 1994, is a third state of solid matter -- in addition to the normal crystalline and glassy states. Quasicrystals exhibit excellent structural order based on atom arrangements. This feature provides quasicrystalline materials with a high degree of hardness and novel electrical and physical properties. This experiment is expected to provide a better understanding of nucleation and short-range order phenomena occurring in undercooled melts. Also, measurement of the specific heat (defined as the heat needed to raise one gram of substance one degree Celsius) will enable better analysis of undercooling experiments performed in space, as well as those performed on Earth. Sample materials used in this experiment are three quasicrystal-forming alloys of aluminum-copper-iron and aluminum-copper-cobalt.

Experiment: Thermal Expansion of Glass Forming Metallic Alloys in the Undercooled State
Facility: TEMPUS
Principal Investigator: Dr. K. Samwer, Institute for Physics, University of Augsburg, Germany.
Co-Investigator: Dr. B. Damaschke, Institute for Physics, University of Augsburg; Dr. Ivan Egry, DLR.

To investigate the thermal expansion of multicomponent amorphous alloys in the wide temperature range between the melting point and the glass transition point. Amorphous alloys are alloys consisting of many metals whose atoms are not arranged in the form of crystalline structures. Solids can be subdivided into crystalline or non-crystalline forms based on the internal arrangement of their atoms or molecules. The glass transition point is where this experiment is expected to reveal new information about both a thermodynamic approach to glassy and undercooled metals and the existence of structural changes in the undercooled alloys, which is important for the development of new customized materials.

Experiment: Experiments on Nucleation in Different Flow Regimes
Facility: TEMPUS
Principal Investigator: Dr. Robert Bayuzick, Vanderbilt University, Nashville, Tenn.
Co-Investigators: Dr. William H. Hofmeister, Vanderbilt University; Dr. Michael B. Robinson, NASA Marshall Space Flight Center.

This investigation looks to better understand specific details on how metals solidify and to investigate ways in which the solidification process can be controlled. Scientists hope to pinpoint what phenomenon kicks off solidification. The current understanding of the nucleation of solids is limited to models derived from the classical theory of nucleation. However, the unique environment of Spacelab provides the combination of requirements -- free-floating melts, great control of conditions within the melt and very careful measurement of temperature -- that will allow for an unparalleled opportunity to test the theory. Solidifying metals is one of the most important processes in industry. Learning more about nucleation may provide clues for making different materials. The studies may help determine the nucleation behavior of zirconium, a strong, ductile refractory metal used chiefly in nuclear reactors and chemical processing equipment.

Alloy Undercooling Experiments
Experiment Facility: TEMPUS
Principal Investigator: Dr. Merton Flemings, Massachusetts Institute of Technology (MIT), Cambridge, Mass.
Co-Investigator: Dr. Douglas Matson, MIT; Dr. Wolfgang Löser, Institut für Festkoerper und Westoffordchug, Dresden, Germany.

To measure the solidification velocity in steel alloys, using a combination of video and sophisticated temperature measurement techniques. Atoms in molten liquid alloy line up in a specified order as the alloy cools and becomes a solid crystal. Scientists hope to learn more about the order in which atoms attach to each other as they grow into a crystal structure.Investigators also want to study the speed at which the crystallization process occurs.The stainless steels employed in this experiment are the same sort of alloys we are familiar with in everyday life, such as the stainless steel used in pots and pans. However, a unique mode of solidification is being studied in this experiment -- one which will alter the internal structure and properties of the material. This experiment is designed to yield information on the transition phases and the speed at which solidification spreads as the temperature at the start of solidification is changed. The experiment has direct application to the design of steel strip casting facilities on Earth and will help scientists understand how welding processes may be conducted in space. This may help industry make better metals. For example, in the casting of high-performance metal components like jet engine turbine blades, each blade is the result of a crystal grown from a single nucleation site. Improving this process may make it possible to construct turbine blades that would have a greater operating efficiency through being capable to withstand higher temperatures. In another example, in welding stainless steels (where rapid solidification is encountered), unexpected and unexplained structures sometimes occur. The fundamental understanding gained in these experiments should help researchers to understand this behavior and to improve the welding process.

Measurement of Surface Tension and Viscosity of Undercooled Liquid Metals
Experiment Facility: TEMPUS
Principal Investigators: Dr. Julian Szekely (deceased); Dr. Merton Flemings, MIT; Dr. Gerardo Trapaga, MIT.
Co-Investigator: Dr. Robert Hyers, MIT.

This experiment is designed to demonstrate a containerless technique to measure both the viscosity -- or the resistance a gas or liquid has to flowing over a solid surface of other layers of fluid -- and the surface tension of reactive and undercooled liquid metals. The metals include zirconium, gold and metallic glass-forming alloys. The experiment will allow for viscosity measurements that are impossible to achieve in Earth-based experiments because of gravity. In the microgravity environment of space, force and fluid flow velocity is greatly reduced, allowing measurements to be taken. To measure the viscosity of a liquid, the internal flow velocity must be kept below a certain value to prevent a transition to turbulence. In ground-based electromagnetic levitation, the same forces that levitate the sample against gravity cause intensely turbulent internal fluid flows, making the measurement of viscosity impossible. In microgravity, however, the force and fluid flow velocity is greatly reduced. With care, it is possible to reduce the internal fluid flows.

Experiment: AC Calorimetry and Thermophysical Properties of Bulk Glass-Forming Metallic Liquids
Experiment Facility: TEMPUS
Principal Investigator: Dr. W.L. Johnson, California Institute of Technology (Caltech), Pasadena, Calif.
Co-Investigator: Dr. David Lee, Caltech.

The experiment will measure the thermophysical properties of glass-forming metallic alloys. Those properties include specific heat capacity, thermal conductivity, nucleation rates, surface tension, viscosity and thermal expansion. The experiment uses a new experimental method termed "non-contact modulation calorimetry" to measure the heat capacity and thermal conductivity of liquid metallic alloys cooled below the point at which they would normally solidify. The undercooled liquid range is accessible because molten metal alloys remain at liquid temperatures below their freezing point when they are suspended in a containerless manner such as provided by TEMPUS. Results of this investigation may lead to improving methods of processing metallic glasses. An understanding of the undercooling and formation of metallic glasses is vital to the design and processing of such materials. Some present applications for metallic glasses include high-powered laser choke switches, transformer cores, brazing alloys, hard-facing for coal-crusher teeth and oil field drill bits, and fly-ash resistant coatings in boilers. In the future, bulk metallic glasses will be made into increasingly complex shapes and their properties further tailored to applications as wide-ranging as the computer industry, processing plants and recreational sports.

MIDDECK GLOVEBOX

The Middeck Glovebox offers scientists the capability to conduct experiments, test science procedures, and develop new technologies in microgravity. The facility enables crew members to handle, transfer, and manipulate experiment hardware and materials that are not approved for use in the open Spacelab. In addition, the facility is equipped with photographic equipment and video and data recording capability, allowing a complete record of experiment operations.

Coarsening in Solid-Liquid Mixtures
D. Peter Voorhees, North Western University, Chicago, IL

The experiment will examine the process of coarsening in metals and use results developed during the mission to compare with current theoretical models. Coarsening may occur during the high-temperature operation of mechanical devices and may result in degradation of the strength of the materials. During coarsening, small particles shrink by loosing atoms to larger particles, causing the larger particles to grow and resulting in lack of uniform particle distribution . Materials containing larger particles are weaker than materials containing many small ones. Although the driving force for coarsening is well characterized, the speed and mechanisms by which it occurs are not.

To develop materials with particular lifetimes and predictable characteristics it is necessary to understand the mechanisms and rates of the coarsening process. This experiment may help researchers develop improved manufacturing processes and stronger metal alloys.

Experiment: Bubble and Drop Nonlinear Dynamics
Dr. L.G. Leal, University of California at Santa Barbara, California

Researchers hope to improve the understanding of how the shape and behavior of bubbles change in response to ultrasonic radiation pressure.It may be possible to develop techniques that eliminate or counteract the complications of that bubbles cause during materials processing. Many industrial applications, including the solidification of certain alloys, involve processes where large numbers of bubbles and drops are used. Scientists will assess their ability to control bubble location, manipulate double bubbles and maximize bubble shape. Shape deformation will be studied using ultrasonic pressure.

Experiment: A Study of Fundamental Operation of a Capillary-driven Heat Transfer (CHT) Device in Microgravity
Dr. Kevin P. Hallinan, University of Dayton, Ohio

Researchers hope to gain an improved understanding of the mechanisms leading to the unstable operation and failure of specialized heat transfer devices in space operations. Capillary-pumped loop devices transfer heat from one location to another, specifically those that move heat away from a particular location, such as in spacecraft where they transfer heat from electrical devices to radiators. The transfer of heat is accomplished by evaporating from one liquid surface at the hot side and condensing the vapor produced at the other side of the loop where heat is discharged into the surrounding area. This experiment investigates the fundamental fluid physics phenomena thought to be responsible for the failure of capillary-pumped loop devices in low-gravity operations.

Experiment: Internal Flows in a Free Drop
Dr. S.S. Sadhal, University of Southern California in Los Angeles, California

Researchers will investigate the capability of current non-contact and remote manipulation techniques for controlling the position and motion of liquids in low-gravity. Free single liquid drops will be deployed and positioned actively using ultrasonic pressure. Tracer particles will within the drops will be recorded by video cameras. Acoustic positioning is an important technique used in containerless processing of materials and in non-contact measurements of viscosity and surface tension. This experiment is important to many processes in chemical manufacturing industries, including such industries as petroleum technology, cosmetics and food sciences.

CRYOGENIC FLEXIBLE DIODE (CRYOFD)

The Cryogenic Flexible Diode (CRYOFD) heat pipe experiment is a Hitchhiker payload flying on Space Shuttle Columbia during the STS-83 mission. Flight testing of heat pipes in space is being conducted to gain advances in passive thermal control technology. Engineers hope to transfer any technology achieved in space to commercial applications on Earth.

Spacecraft electronics are packed tightly together and generate heat, which can limit their performance. Heat pipes can remove heat from the electronics and redirect it to other areas that need heating or to radiators that vent that heat outside the spacecraft. Heat pipes are primarily used in spacecraft and play an ever-increasing role in spacecraft telecommunications.

CRYOFD is a flight experiment jointly developed and sponsored by NASA's Goddard Space Flight Center in Greenbelt,Md. and the U.S. Air Force Phillips Laboratory in Albuquerque. The CRYOFD experiment is on the cutting edge of thermal control technology. The payload consists of two heat pipe experiments: the Cryogenic Flexible Diode Heat Pipe (CFDHP) and the American Loop Heat Pipe with Ammonia (ALPHA). Cryogenic heat pipes are used to cool instruments and improve their performance.

There are two CFDHP units: one uses oxygen as the working fluid to operate at temperatures as low as 60 Kelvin; the other uses methane to operate at temperatures as low as 100 Kelvin. These heat pipes incorporate unique flexible wick designs and flexible bellows to permit easier integration into a spacecraft or with an instrument. Since they are flexible, heat pipes also permit pointing of the instrument.

The ALPHA experiment represents the first flight demonstration of the American Loop Heat Pipe. ALPHA will operate near room temperature (20 °C) and can transport heat loads of up to 500 watts over distances of 1 - 2 meters with a very small temperature drop (e.g., less than 10 °C). Deployable radiators for high power telecommunications spacecraft are a potential application of this technology.

The Hitchhiker Project is managed by the Shuttle Small Payloads Project in the Engineering Directorate at Goddard. Hitchhiker's modular hardware also allows for flexibility in locating and manifesting experiments of different sizes and needs to optimize use of the Shuttle Cargo Bay. Hitchhiker avionics provide power and control data flow between the CRYOFD payload and the Shuttle. The avionics unit also carries the equipment for transmitting the data real-time to Goddard. Experimenters can command their payload and downlink data in realtime from the Payload Operations Control Center located at Goddard.

More information on the CRYOFD mission can be found on the world wide web at: http://sspp.gsfc.nasa.gov/cryofd.htm. The mission manager for the flight of CRYOFD is Susan Olden of Goddard Center and the principal investigator is Marko Stoyanof from USAF Phillips Laboratory in Albuquerque.

SHUTTLE AMATEUR RADIO EXPERIMENT

STS-83 will include Amateur (or "ham") radio, where radio operators and students will attempt to make radio contacts with the orbiting Shuttle as part of a project called Shuttle Amateur Radio EXperiment, or SAREX. Amateur Radio has been flying aboard the Shuttles since 1983.

Ham radio operators from around the world will point their antennas at the Space Shuttle Columbia, hoping to find the astronauts on-the-air. Some of these amateurs have volunteered to assist student groups who have prepared questions to ask the astronauts during specially scheduled contact times. To make their radio contacts, the astronauts will use a radio aboard the Shuttle on frequencies used by ham radio operators.

To operate Amateur Radio from the Space Shuttle, one or more of the astronauts must have an Amateur Radio license. The STS-83 crew members who are licensed Amateur Radio operators include Commander James D. Halsell, Payload Commander Janice E. Voss, and Mission Specialist Donald A. Thomas.

During SAREX missions, the astronauts will typically make the following types of Amateur Radio contacts:

* Scheduled radio contacts with schools.
* Random radio contacts with the Amateur Radio community.
* Personal contacts with the astronauts' families.

SAREX SPONSORS: The Shuttle Amateur Radio EXperiment (SAREX) is sponsored by the American Radio Relay League (ARRL), The Radio Amateur Satellite Corporation (AMSAT) and The National Aeronautics and Space Administration (NASA). SAREX is supported by the Federal Communications Commission.

SHUTTLE TRACKING: Current Keplerian elements to track the Shuttle are available from the following sources:

* NASA Spacelink computer information system
  BBS: (205) 895-0028 [VT-100, 8-N-1]
  Telnet, FTP, and Gopher: spacelink.msfc.nasa.gov
  World Wide Web: http://spacelink.msfc.nasa.gov
  Internet TCP/IP address: 192.149.89.61

* NASA SAREX WWW Home Page: http://www.nasa.gov/sarex/sarex_mainpage.html
* ARRL
  W1AW news bulletins (frequencies and times listed under "FOR FURTHER INFORMATION")
  BBS: (860) 594-0306
  ARRL World Wide Web: http://www.arrl.org/sarex/
* AMSAT
  World Wide Web: http://www.amsat.org
* Johnson Space Center Amateur Radio Club
  World Wide Web: http://www.phoenix.net/~mbordel/jscarc/index.html
  BBS: (713) 244-5625
* Goddard Amateur Radio Club
  BBS: (301) 286-4137
  World Wide Web: http://garc.gsfc.nasa.gov/www/garc-home-page.html
  Packet: WA3NAN on 145.090 MHz in DC area

CONFIGURATION: During STS-83, the SAREX hardware will be flown in configuration C.

FOR FURTHER INFORMATION:
Contact the American Radio Relay League
Educational Activities Department
225 Main Street, Newington CT 06111-1494 USA
Telephone (860) 594-0301, FAX (860) 594-0259, ARRL BBS (860) 594-0306
Internet sarex@arrl.org
World Wide Web http://www.arrl.org/
CompuServe 70007,3373
America Online HQARRL1

ARRL's (Newington, CT) Amateur Radio station (call sign W1AW) transmits news bulletins (9:45 PM, 12:45 AM EST) on HF bands at 1.855, 3.99, 7.29, 14.29, 18.16, 21.39, 28.59 megahertz (MHz).

Members of the Goddard Amateur Radio Club (Greenbelt, MD) re-transmit live, Shuttle air-to-ground audio over the amateur frequencies from their club station, WA3NAN. To listen-in, tune to Amateur Radio high frequency (HF) bands at 3.86, 7.185, 14.295, 21.395, and 28.65 megahertz (MHz) and in the Maryland/DC area, on a very high frequency (VHF) band at 147.45 MHz.

STS-83 CREW BIOGRAPHIES

James Donald Halsell, Jr: STS-83 Mission Commander:
(Lieutenant Colonel, USAF)

BIRTH DATE/PLACE:
Born September 29, 1956, in Monroe, Louisiana. Considers West Monroe, Louisiana, his home.

EDUCATION:
Graduated from West Monroe High School, West Monroe, Louisiana, in 1974; received a bachelor of science degree in engineering from the United States Air Force (USAF) Academy in 1978, a master of science degree in management from Troy University in 1983, and a master of science degree in space operations from the Air Force Institute of Technology in 1985.

RECREATIONAL INTERESTS:
Enjoys snow skiing, water skiing, light aircraft flying, running and exercising.

ORGANIZATIONS:
Member of the Society of Experimental Test Pilots (SETP).

SPECIAL HONORS:
Graduated first in test pilot school class and awarded the Liethen/Tittle Trophy for the Best Overall Record for Flying and Academic Performance (1986). Recipient of the USAF Flying Safety Award (1980), and the USAF Pilot Training Academic Award (1979).

EXPERIENCE:
Halsell graduated from the USAF Academy in 1978, and from Undergraduate Pilot Training at Columbus Air Force Base, Mississippi, in 1979. Assigned to Nellis Air Force Base, Las Vegas, Nevada, from 1980-1981, he served as an F-4D aircraft commander, qualified in conventional and nuclear weapons deliveries. From 1981-1984, he was stationed at Moody Air Force Base, Valdosta, Georgia, where he served as an F-4E flight lead and instructor pilot. In 1984-1985, he was a graduate student at the Air Force Institute of Technology, Wright-Patterson Air Force Base, Dayton, Ohio. His thesis, sponsored by JSC Crew Systems Division, prototyped a space rescue transfer vehicle using off-the-shelf equipment. He then attended the Air Force Test Pilot School at Edwards Air Force Base, California, and during the next four years he performed test flights in the F-4, the F-16, and the SR-71 aircraft.

Selected by NASA in January 1990, Halsell became an astronaut in July 1991. Assigned to the Astronaut Office Mission Support Branch, Halsell initially served as a spacecraft communicator (CAPCOM) in the Mission Control Center (MCC). Subsequently, he was assigned to the Astronaut Support Personnel team which helps to prepare the Space Shuttle vehicles for flights at the Kennedy Space Center, Florida.

Halsell was the pilot on STS-65. The seven-member crew aboard Space Shuttle Columbia launched from Kennedy Space Center in Florida on July 8, 1994, and returned there on July 23, 1994, setting a new flight duration record for the Space Shuttle program. The STS-65 mission flew the second International Microgravity Laboratory (IML-2). During the 15-day flight the crew conducted more than 80 experiments focusing on materials and life sciences research in microgravity. The mission was accomplished in 236 orbits of the Earth, traveling 6.1 million miles.

Most recently, Halsell served as pilot on STS-74, NASA's second Space Shuttle mission to rendezvous and dock with the Russian Space Station Mir. During the 8 day flight the crew aboard Space Shuttle Atlantis successfully attached a permanent docking module to Mir and transferred over 2,000 pounds of food, water and scientific supplies for use by the cosmonauts. The STS-74 mission was accomplished in 129 orbits of the Earth, traveling 3.4 million miles in 196 hours, 30 minutes, 44 seconds.

Susan Leigh Still: STS-83 Pilot
(Lieutenant Commander, USN)

BIRTHDATE/PLACE:
Born October, 24, 1961, in Augusta, Georgia. Her parents, Joe and Sue Still, reside in Martinez, Georgia. Her mother, Jean Ann Batho Still, is deceased.

PHYSICAL DESCRIPTION:
Blonde hair; brown eyes; 5 feet 6 inches; 120 pounds.

EDUCATION:
Graduated from Walnut Hill High School, Natick, Massachusetts, in 1979. Bachelor of science degree in aeronautical engineering from Embry-Riddle University, 1982. Master of science degree in aerospace engineering from Georgia Institute of Technology, 1985.

RECREATIONAL INTERESTS:
Enjoys triathlons, martial arts, and playing the piano.

ORGANIZATIONS:
Association of Naval Aviation.

SPECIAL HONORS:
Distinguished Naval Graduate of Aviation Officer Candidate School; Distinguished Graduate of the United States Naval Test Pilot School, Class 103; Awarded the Navy Commendation Medal, Navy Achievement Medal, and National Defense Service Medal.

EXPERIENCE:
After graduating from undergraduate school, Susan worked as a Wind Tunnel Project Officer for Lockheed Corporation in Marietta, Georgia and earned her graduate degree.

She was commissioned in 1985 and designated a naval aviator in 1987. Still was selected to be a flight instructor in the TA-4J Skyhawk. She later flew EA-6A Electric Intruders for Tactical Electronic Warfare Squadron 33 in Key West, Florida. After completing Test Pilot School, she reported to Fighter Squadron 101 in Virginia Beach, Virginia for F-14 Tomcat training. She has logged over 2,000 flight hours in more than 30 different aircraft.

NASA EXPERIENCE:
Selected by NASA in December 1994, Susan reported to the Johnson Space Center in March 1995, has completed a year of training and evaluation, and is currently qualified for assignment as a shuttle pilot. She is presently working technical issues for the Vehicle Systems and Operations Branch of the Astronaut Office while awaiting her first flight assignment.

Janice Voss: STS-83 Payload Commander / Mission Specialist-1
(Ph.D.)

BIRTH DATE/PLACE:
Born October 8, 1956, in South Bend, Indiana, but considers Rockford, Illinois, to be her hometown. Her parents, Dr. & Mrs. James R. Voss, reside in Dupont, Indiana.

PHYSICAL DESCRIPTION:
Light brown hair; brown eyes; 5 feet 6 inches; 130 pounds.

EDUCATION:
Graduated from Minnechaug Regional High School, Wilbraham, Massachusetts, in 1972; received a bachelor of science degree in engineering science from Purdue University in 1975, a master of science degree in electrical engineering and a doctorate in aeronautics/astronautics from the Massachusetts Institute of Technology in 1977 and 1987, respectively. From 1973 to 1975 she took correspondence courses at the University of Oklahoma. She also did some graduate work in space physics at Rice University in 1977 and 1978.

RECREATIONAL INTERESTS:
Reading science fiction, dancing, volleyball, flying.

ORGANIZATIONS:
Member of the American Institute of Aeronautics and Astronautics (AIAA).

SPECIAL HONORS:
NASA Space Flight Medals (1993, 1995); Zonta Amelia Earhart Fellowship (1982); Howard Hughes Fellowship (1981); National Science Foundation Fellowship (1976).

EXPERIENCE:
Dr. Voss was a co-op at the NASA Johnson Space Center from 1973 to 1975. During that time she did computer simulations in the Engineering and Development Directorate. In 1977 she returned to the Johnson Space Center and, for a year, worked as a crew trainer, teaching entry guidance and navigation. She completed her doctorate in 1987 and accepted a job with Orbital Sciences Corporation. Her responsibilities there included mission integration and flight operations support for an upper stage called the Transfer Orbit Stage (TOS). TOS launched the Advanced Communications Technology Satellite (ACTS) from the Space Shuttle in September 1993, and the Mars Observer from a Titan in the Fall of 1992.

Selected by NASA in January 1990, Dr. Voss became an astronaut in July 1991. She is qualified for assignment as a mission specialist on future Space Shuttle flight crews. Her technical assignments have included working Spacelab/Spacehab issues for the Astronaut Office Mission Development Branch, and robotics issues for the EVA/Robotics Branch. Dr. Voss first flew on STS-57 (June 21 to July 1, 1993). Mission highlights included retrieval of the European Retrievable Carrier (EURECA) with the Shuttle's robotic arm, a spacewalk by two crew members, and an assortment of experiments in the first flight of the Spacehab middeck augmentation module. More recently, she flew on STS-63 (February 3-11, 1995). Mission highlights included the rendezvous with the Russian Space Station, Mir, the deployment and retrieval of Spartan 204, and the third flight of Spacehab. In completing her second flight, Dr. Voss has logged over 438 hours in space.

Michael L. Gernhardt: STS-83 Mission Specialist-2
(Ph.D.)

BIRTH DATE/PLACE:
Born May 4, 1956, in Mansfield, Ohio. His father, George M. Gernhardt, resides in Marco Island, Florida. His mother, Suzanne C. Winters, resides in Whitestone, Virginia.

PHYSICAL DESCRIPTION:
Blond hair; blue eyes; 6 feet 2 inches; 175 pounds.

EDUCATION:
Graduated from Malabar High School, Mansfield, Ohio, in 1974; received a bachelor of science degree in physics from Vanderbilt University in 1978; master of science degree and a doctorate in bioengineering from University of Pennsylvania, in 1983 and 1991, respectively.

RECREATIONAL INTERESTS:
Enjoys running, swimming, triathlons, flying, fishing, snow skiing, tennis, and scuba diving.

ORGANIZATIONS:
Member, American Institute of Aeronautics and Astronautics (AIAA), and the Undersea and Hyperbaric Medical Society.

EXPERIENCE:
From 1977 to 1984, Gernhardt worked as a professional deep sea diver and project engineer on a variety of subsea oil field construction and repair projects around the world. He has logged over 700 deep sea dives and has experience in air, mixed gas, bounce bell and saturation diving. During his diving career Gernhardt attended graduate school at the University of Pennsylvania and developed a new theoretical decompression model based on tissue gas bubble dynamics. He then participated in the development and field implementation of a variety of new decompression tables. From 1984 to 1988, Gernhardt worked as Manager and then Vice President of Special Projects for Oceaneering International. During this time he led the development of a telerobotic system for subsea platform cleaning and inspection as well as a variety of new diver and robot tools. In 1988 he founded Oceaneering Space Systems, a wholly owned subsidiary of Oceaneering International. From 1988 until his selection by NASA in 1992, he worked on the development of new astronaut and robot-compatible tools for performing maintenance on Space Station Freedom. He also worked on the development of new portable life support systems and decompression procedures for extravehicular activity.

NASA EXPERIENCE:

Dr. Gernhardt was selected by NASA in March 1992, and reported to the Johnson Space Center in August 1992. His technical assignments include having served in the Astronaut Office Mission Support Branch, detailed to flight software verification in the Shuttle Avionics Integration Laboratory (SAIL). He also worked on the development of nitrox diving to support training for the Hubble Space Telescope repair and on a variety of Space Station EVA developments.

Most recently, Dr. Gernhardt was a mission specialist on STS-69 which launched on September 7, 1995. The primary objective was the successful deployment and retrieval of a SPARTAN satellite and the Wake Shield Facility (WSF). The WSF is designed to evaluate the effectiveness of using this free-flying experiment to grow semiconductors, high temperature superconductors and other materials using the ultra-high vacuum created behind the spacecraft near the experiment package. Dr. Gernhardt was one of two astronauts to perform a spacewalk to evaluate future Space Station tools and hardware.

Following 171 orbits of the Earth, Endeavour landed at the Kennedy Space Center on September 18, 1995. In completing his first space flight, Mike logged a total of 260 hours, 29 minutes, and 8 seconds in space, including 6 hours and 46 minutes of EVA.

Donald A. Thomas: STS-83 Mission Specialist-3
(Ph.D.)

BIRTH DATE/PLACE:
Born May 6, 1955, in Cleveland, Ohio. His mother, Mrs. Irene M. Thomas, resides in Bloomington, Indiana.

PHYSICAL DESCRIPTION:
Brown hair; brown eyes; 5 feet 10 inches; 160 pounds

EDUCATION:
Graduated from Cleveland Heights High School, Cleveland Heights, Ohio, in 1973; received a bachelor of science degree in Physics from Case Western Reserve University in 1977, and a master of science degree and a doctorate in Materials Science from Cornell University in 1980 and 1982, respectively. His dissertation involved evaluating the effect of crystalline defects and sample purity on the superconducting properties of niobium.

MARITAL STATUS:
Married to the former Simone Lehmann of Göppingen, Germany. Her parents, Margrit and Gerhard Lehmann, reside in Göppingen, Germany.

CHILDREN:
Son, Kai, February 16, 1995.

RECREATIONAL INTERESTS:
Swimming, biking, camping, flying.

ORGANIZATIONS:
Member, American Institute of Aeronautics and Astronautics (AIAA), and Tau Beta Pi.

SPECIAL HONORS:
Graduated with Honors from Case Western Reserve University in 1977. Recipient of NASA Sustained Superior Performance Award, 1989. Recipient of NASA Group Achievement Awards in 1990, 1992, and 1994 for his work on the Microgravity Disturbances Experiment, the Shuttle System Safety Review Panel, and development of the Microgravity Measurement Device.

EXPERIENCE:
Following graduation from Cornell University in 1982, Dr. Thomas joined AT&T Bell Laboratories in Princeton, New Jersey, working as a Senior Member of the Technical Staff.

His responsibilities there included the development of advanced materials and processes for high density interconnections of semiconductor devices. He was also an adjunct professor in the Physics Department at Trenton State College in New Jersey. He holds two patents and has authored several technical papers. He left AT&T in 1987 to work for Lockheed Engineering and Sciences Company in Houston, Texas, where his responsibilities involved reviewing materials used in Space Shuttle payloads. In 1988 he joined NASA's Lyndon B. Johnson Space Center as a Materials Engineer. His work involved lifetime projections of advanced composite materials for use on Space Station Freedom. He was also a Principal Investigator for the Microgravity Disturbances Experiment, a middeck crystal growth experiment which flew on STS-32 in January 1990. This experiment investigated the effects of Orbiter and crew-induced disturbances on the growth of crystals in space.

He is a private pilot with over 250 hours in single engine land aircraft and gliders, and over 500 hours flying as mission specialist in NASA T-38 jet aircraft.

Selected by NASA in January 1990, Dr. Thomas became an astronaut in July 1991. He has worked in the Safety and Operations Development Branches of the Astronaut Office working on issues relating to Shuttle Orbiter systems, and was also a spacecraft communicator (CAPCOM) for Shuttle missions STS-47, 52 and 53. A veteran of two space flights, he flew as a mission specialist on STS-65 in 1994, and STS-70 in 1995, and has logged 568 hours and 15 minutes in space. He is scheduled to fly aboard Columbia on STS-83 in the Spring of 1997.

STS-65 flew the second International Microgravity Laboratory (IML-2) spacelab module. The seven-member crew aboard Space Shuttle Columbia launched from Kennedy Space Center in Florida on July 8, 1994, and returned there on July 23, 1994, setting a new flight duration record for the Space Shuttle program. During the 15-day flight the crew conducted more than 80 experiments focusing on materials and life sciences research in microgravity.

The mission was accomplished in 236 orbits of the Earth, traveling 6.1 million miles. Dr. Thomas next served on STS-70, and was responsible for the deployment of the sixth and final Tracking and Data Relay Satellite from the Space Shuttle. The five-member crew aboard Space Shuttle Discovery launched from the Kennedy Space Center July 13, 1995, and returned there July 22, 1995. During this 8 day 22 hour mission, the crew completed 142 orbits of the Earth, traveling 3.7 million miles.

Roger K. Crouch: STS-83 Payload Specialist-1

BIRTHPLACE AND DATE:

Considers Jamestown, TN, where he was born September 12, 1940, as his hometown. Currently resides in Laurel, MD. His mother, Mrs. Maxine S. Crouch, lives in Jamestown. His father, Willard Crouch is deceased.

PHYSICAL DESCRIPTION:

Brown hair; hazel eyes; 6 feet; 195 pounds.

EDUCATION:

Earned a bachelor of science in physics from Tennessee Polytechnic Institute in 1962, a master of science and a doctor of philosophy in physics from Virginia Polytechnic Institute in 1968 and 1971, respectively. He was a visiting scientist at Massachusetts Institute of Technology in 1979-80.

EXPERIENCE:

As the Chief Scientist of the NASA Microgravity Space and Applications Division since 1985 he has served as the manager for a research program that supports materials science, fluid physics, low temperature microgravity physics, combustion science, and biotechnology. He had responsibility for assuring that experiments in the flight program achieved the highest levels of scientific results possible. He served as Program Scientist on Spacelab J, the second International Microgravity Laboratory Program (IML-2), the first United States Microgravity Laboratory (USML-1) and a Program Scientist (Materials Sciences) IML-1.

In addition, he helped organize and has served as co-chairman for Microgravity Science Working Groups between NASA and the European Space Agency, France, Germany, Japan and Russia. He was the co-chair of the International Microgravity Science Strategic Planning Group. He was the co-chair for the IML Science Working Group from 1985-1989. He has served on several governmental interagency panels on Materials Science, most recently as a team member assessing the potential for collaborative efforts between the U.S. and China. He was a co-principal investigator on an experiment that flew in the Materials Experiment Apparatus on the D-1 mission. Prior to working in NASA Headquarters, he had been at the Langley Research Center since 1962. His last position there was group leader of a research group investigating the effects of convection on semiconductor properties. He was a principal investigator in the MSAD flight program from 1977-1985. He has done research in various types of semiconductor crystal growth, electrical and optical properties of materials, electronic devices for remote sensing and flat panel displays and heat shield protection for reentry space vehicles. He trained as the Alternate Payload Specialist on STS-42 (First International Microgravity Laboratory).

PUBLICATIONS:

Published over 40 technical papers and more than 40 technical presentations in various areas of research, concentrating since 1978 on semiconductor crystal growth and the influence of gravitational forces on materials properties.

SPECIAL HONORS:

Floyd Thompson Fellowship 1979; Quality Increase 1972, 1986, 1988; Exceptional Service Award 1989; Outstanding Performance Rating, 1985, 1986, 1987, 1989, Certificates of Recognition 1973, 1975, 1976, 1977, 1979, 1980, 1981, 1984 (2), 1985, 1986, 1987 (3), Special Achievement Award, 1983, Sustained Superior Performance Award, 1989, Superior Accomplishment Award 1992, NASA Exceptional Achievement Medal 1995.

ORGANIZATIONS:

Member of American Physcal Society, American Association for Crystal Growth, Sigma Pi Sigma, Kappa Mu Epsilon.

RECREATIONAL INTERESTS:

Hobbies include traveling, photography, basketball, softball, camping, hiking, fishing, and whitewater rafting.

Gregory T. Linteris: STS-83 Payload Specialist-2
(Ph.D.)

BIRTHPLACE AND DATE:
Born October 4, 1957, in Demarest, New Jersey, where his parents, Lino Luigi Linteris and Helen Mary Linteris reside.

PHYSICAL DESCRIPTION:
Brown hair; brown eyes; 5 feet 7 inches; 135 pounds.

EDUCATION:
Graduated from Northern Valley Regional High School at Demarest, New Jersey in 1975; received a bachelor of science degree in chemical engineering from Princeton University in 1979; obtained a master of science degree from the design division of the mechanical engineering department at Stanford University in 1984; and was awarded a doctorate in mechanical and aerospace engineering from Princeton University in 1990.

RECREATIONAL INTERESTS:
He enjoys running, skiing, board sailing, hiking, backpacking, and reading, and was a member of Princeton's wrestling team.

ORGANIZATIONS:
Member of American Institute of Aeronautics and Astronautics, American Physical Society, Combustion Institute, Sigma Xi.

PUBLICATIONS:
Dr. Linteris has over 40 publications in the areas of combustion, chemical kinetics, spectroscopy, and heat transfer.

SPECIAL HONORS:
Graduated with honors from Princeton University (1979). Awarded a Mechanical Engineering Department Fellowship from Stanford University (1983), and received Fourth Place in the James F. Lincoln National Design Competition (1984). At Princeton, he was the recipient of a Guggenheim Fellowship (1985), a Grumman Prize for excellence in Research (1988), and the Luigi Crocco Award (1988) for outstanding performance as an Assistant in Instruction.

EXPERIENCE:
At Princeton from 1985 to 1990, Dr. Linteris studied the high temperature chemical kinetics of combustion reactions in a turbulent chemical kinetic flow reactor using laser induced fluorescence and laser absorption. As a research staff member at the University of California, San Diego, from 1990 to 1992, he studied droplet dynamics and performed numerical and analytical modeling of the chemistry important in the gas-phase reaction region of solid rocket propellants.

Since 1992 he has been at the National Institute of Standards and Technology where he has been developing a research program on advanced fire suppressants and studying the inhibition mechanisms of chemical inhibitors. He is Principle Investigator on a NASA microgravity combustion experiment: "Chemical Inhibitor Effects on Diffusion Flames in Microgravity."

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

April 1, 1997

Beth Schmid
Headquarters, Washington, DC
(Phone: 202/358-1760)

Edward Campion
Johnson Space Center, Houston, TX
(Phone: 281/483-5111)

NOTE TO EDITORS: N97-23

TWENTY-FOUR TEAMS OF COLLEGE STUDENTS PREPARE EXPERIMENTS FOR NASA'S REDUCED GRAVITY AIRCRAFT

Twenty-four teams of undergraduate college students from around the country will "float" through school aboard a NASA research aircraft during a two-week program in April called the 1997 NASA Reduced Gravity Student Flight Opportunities, a pilot program funded by NASA and administered by the Texas Space Grant Consortium.

Each team consists of up to four undergraduate-level college students, a supervising professor, and a local professional journalist, all of whom will fly except the supervising professor. Teams will develop and fly experiments aboard a KC-135A aircraft that flies a roller-coaster-like flight profile over the Gulf of Mexico. Astronauts train for space flight and NASA scientists have conducted extensive experiments aboard the aircraft.

During each two-to-three-hour flight, the aircraft maneuvers through steep climbs and descents. At the top of each ascent, passengers inside the aircraft experience 25 to 40 seconds of weightlessness. The teams will design, build, test, and operate experiments that take advantage of the reduced-gravity environment provided by the NASA aircraft. In addition to performing the experiments, each team will develop a program for sharing its research results with teachers, students, and the general public. The program's flight phase will begin April 7 at Ellington Field, near the Johnson Space Center in Houston, TX.

During the first week, participants will receive pre-flight training and assemble their experiment packages. During the second week, they will fly with their experiments, adjust the equipment as needed, and conduct post-flight debriefings and reviews. Each team will fly twice, and depending on the precise trajectory, passengers and their experiments can experience about 25 seconds of zero gravity, 30 seconds of one-sixth gravity (the same as the gravity on the surface of the Moon), or 40 seconds of one-third gravity (the same as Mars).

A list of participating universities can be obtained by calling Beth Schmid at the number listed above.

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Video Advisory

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release
April 1, 1997

Deanna Corridon
Headquarters, Washington, DC
(Phone: 202/358-1733)

VIDEO ADVISORY: V97-29

MEDICINAL PLANTS ON NTV

Featured on NTV Tuesday, studies of plants exposed to microgravity on the next Space Shuttle mission may lead to the production of life-saving medicines. The Video File also will include astronaut crew interviews for the STS-83 Space Shuttle Columbia mission scheduled for April 3. Replaying on NTV will be animation and B-roll depicting the Microgravity Science Laboratory-1 experiments that will be conducted on STS-83.

NTV will continue to provide a Comet Hale-Bopp viewing guide.

ITEM #1: MEDICINAL PLANTS
B-roll of plants being loaded into the Plant Generic Bioprocessing Apparatus (PGBA). *For more information contact Michael Braukus at (202) 358-1979 or David Morse at (415) 604-4724.*

ITEM	**#2:**	**INTERVIEW - DR. GERALD HEYENGA, NASA AMES RESEARCH CENTER**
ITEM	**#3:**	**INTERVIEW - ALEX HOEHN, LEAD ENGINEER FOR PLANT GENERIC BIOPROCESSING APPARATUS**
ITEM	**#4:**	**REPLAY - STS-83 ANIMATION**
ITEM	**#5:**	**REPLAY - COARSENING IN SOLID-LIQUID MIXTURE EXPERIMENT (CSLM)**
ITEM	**#6:**	**REPLAY - DIFFUSION PROCESS IN MOTION SEMICONDUCTORS (DPIMS)**
ITEM	**#7:**	**REPLAY - CAPILLARY HEAT TRANSFER (CHT)**
ITEM	**#8:**	**REPLAY - FIBER SUPPORTED DROPLET COMBUSTION-2 (DFDC-2)**
ITEM	**#9:**	**REPLAY - DROPLET COMBUSTION EXPERIMENT (DCE).**
ITEM	**#10:**	**REPLAY - LIQUID PHASE SINTERING (LPS)**
ITEM	**#11:**	**REPLAY - LAMINAR SOOT PROCESSES (LSP).**
ITEM	**#12:**	**REPLAY - STRUCTURE OF FLAME BALLS AT LOW F/LEWIS-NUMBER (SOFBALL).**
ITEM	**#13:**	**REPLAY - PHYSICS OF HARD SPHERES EXPERIMENT (PHASE)**
ITEM	**#14:**	**REPLAY - TURNING UP THE HEAT--MSL LARGE ISOTHERMAL FURNACE**
ITEM	**#15:**	**REPLAY - EXPRESS FLIGHT--MSL EXPRESS RACK**
ITEM	**#16:**	**REPLAY - HEAVY METAL**
ITEM	**#17:**	**REPLAY - THE KEYS TO DISEASE**
ITEM	**#18:**	**STS-83 ASTRONAUT CREW INTERVIEWS**
ITEM	**#19:**	**REPLAY - HALE-BOPP SPEEDS THROUGH THE SOLAR SYSTEM**
ITEMS	**#20-22:**	**DAILY HALE-BOPP VIEWING GUIDES (APRIL 1-16)**

Video news file today at noon, 3, 6, 9 p.m. and midnight EST.

NTV is available on GE-2, transponder 9C at 85 degrees West longitude, vertical polarization, with a frequency of 3880 MHz, and audio of 6.8 MHz.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Beth Schmid
Headquarters, Washington, DC
(Phone: 202/358-1760)

April 1, 1997

Donna Drelick
Goddard Space Flight Center, Greenbelt, MD
(Phone: 301/286-7995)

Sally Harrington
Lewis Research Center, Cleveland, OH
(Phone: 216/433-2037)

John Watson
Jet Propulsion Laboratory, Pasadena, CA
(Phone: 818/354-0474)

RELEASE: 97-61

NASA TECHNOLOGY TO BE INDUCTED INTO THE SPACE TECHNOLOGY HALL OF FAME

The U.S. Space Foundation, Colorado Springs, CO, has selected two NASA technologies to be inducted into its Space Technology Hall of Fame in a ceremony to take place there on April 3 as part of the Foundation's 1997 National Space Symposium.

NASA's Lewis Research Center, Cleveland, OH, along with NASA Headquarters and a number of contractors, conceived and produced the Advanced Communication Technology Satellite (ACTS), which is being recognized for its contributions in both space technology and spinoff developments. Lewis has implemented a partnership program with industry, government and academia, in which ACTS technologies have demonstrated numerous applications in telemedicine and long-distance education, and in commercial fields such as the banking and petroleum industries.

In addition, ACTS' onboard switching and other technologies have been incorporated into the systems of several major telecommunications firms. The Jet Propulsion Laboratory, Pasadena, CA, is a significant partner in ACTS, having responsibility for pioneering its mobile uses and for studying and publishing the propagation effects at Ka band (30GHz/20GHz) frequencies.

-more-

The Goddard Space Flight Center, Greenbelt, MD, and a contractor, Scientific Imaging Technologies, Inc., developed new charge coupled devices (silicon chips that convert light directly into electronic or digital images) for the stringent requirements of the Hubble Space Telescope. It was determined that this technology also would be ideal for breast cancer detection because of the common requirements between space and medical imaging: high resolution to see fine details, wide dynamic range, and low light sensitivity to shorten exposure time.

Commercialization of this NASA technology resulted in the development of the StereoGuide Breast Biopsy System, manufactured by the LORAD subsidiary of Trex Medical Corp. Radiologists using this system predict it will reduce national health care costs by approximately one billion dollars annually. It is a minimally invasive procedure that exposes the patient to about half the radiation of conventional X-rays. It saves women time, reduces pain, and eliminates scarring.

NASA's Lewis Research Center and Goddard Space Flight Center, NASA Headquarters and the Jet Propulsion Laboratory and many of their employees are being recognized by the Space Technology Hall of Fame for their part in these two winning technologies.

-end-

News Release

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

Michael Braukus
Headquarters, Washington, DC
(Phone: 202/358-1979)

David Morse
Ames Research Center, Mountain View, CA
(Phone: 415/604-4724)

For Release
April 1, 1997

RELEASE: 97-62

SHUTTLE EXPERIMENT TO STUDY MEDICINAL PROPERTIES OF PLANTS

Studies of plants on the next Space Shuttle mission may someday lead to the production of life-saving medicines and other important compounds.

The experiments conducted by Dr. Gerard Heyenga at NASA's Ames Research Center, Mountain View, CA, will be part of the 16-day STS-83 mission, scheduled for launch this week.

"A fundamental objective of this research is to evaluate whether microgravity may be used to alter specific metabolic pathways in plants, and ultimately apply this technology for Earth-based benefits," Heyenga said.

Heyenga hypothesizes that extended exposure of plants to microgravity may reduce their expenditure of energy on structural components, thereby increasing flow through other metabolic pathways, many of which produce materials of important medicinal value. Of even greater significance is the possibility that corresponding changes may occur at a genetic level, he said.

A comparison between space- and Earth-grown plants would give a unique opportunity to obtain a greater understanding of how these pathways are controlled at the gene level, Heyenga said. In turn, "such knowledge would allow us to manipulate or genetically engineer plants with desired metabolic traits," he added. "For example, this information could be applied to the lumber industry in the production of trees with a low lignin content, greatly reducing the cost of paper production both economically and environmentally." Conversely, it might be applied to improving timber quality in fast-growing softwoods, reducing the need to harvest slow-growing hardwoods, he said. "If this hypothesis is correct and achievable, it obviously represents the basis for a multi-billion dollar industry and certainly highlights the value of space-related research and such facilities as the Space Station."

- more -

A critical requirement in the investigation is the ability to maintain well-characterized and high-quality plant-growth conditions during space flight and corresponding Earth experiments. "To achieve a meaningful understanding of the effects of microgravity on plants, it is essential that we minimize or avoid additional factors that may cause any stress and that complicate the evaluation," Heyenga said.

To this end, the flight experiment will involve the use of a new, advanced plant growth facility known as the Plant Generic Bioprocessing Apparatus (PGBA), built by BioServe, a NASA Commercial Space Center located at the University of Colorado in Boulder. The chamber was first flown on the Space Shuttle in 1996. "While it was essentially a hardware verification test, the PGBA produced a particularly high quality of plant material over the ten-day mission, which provided a good basis for further research," Heyenga said.

The PGBA chamber maintains a highly controlled environment, supplying appropriate light, temperature and gas exchange conditions. The chamber will utilize the new modular "nutrient pack system" designed by Heyenga to supply plants with water and nutrients throughout the mission. Thirty packs will be used to support the growth of nine plant species.

The packs offer several advantages over existing systems. Depending on the type of supporting substrate used, packs may reabsorb water from the chamber's condensate recovery system, closing the water loop and presenting an important opportunity for long-term plant cultivation. A number of packs will utilize a gel matrix that will allow the examination of the roots' spatial orientation. Since the matrix is safely encapsulated in a protective membrane, the nutrient pack system has been certified for the first radiolabelling tracing experiment of higher plants in space. "This technology will open an entirely new area of space plant physiology, allowing the study of issues not previously possible," Heyenga said. "It is likely to lead to some very exciting results."

The plant species chosen for the flight experiment include a member of the black pepper family. This choice was based on a collaborative effort with a research group in Brazil. "I believe it is highly important that we utilize every possible means to expand our understanding in space research," Heyenga said. "The use of such tropical species, with their unique and specific metabolic pathways, hopefully will provide us with an early indicator of whether our hypothesis is correct while the plants are exposed to the relatively short period of microgravity experienced during a typical Space Shuttle mission."

Despite the complexity of the research program, Heyenga is pleased with progress so far. "The work has involved a particularly broad multidisciplinary effort by a number of organizations. As a visiting scientist on a National Research Council fellowship, it is unique to find a place like Ames that can support this type of activity," he said. "Earlier work by Dr. Robert MacElroy and Dr. Mark Kliss at Ames in the area of enclosed plant growth systems has provided important support for the present flight experiment."

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News Release

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release

Douglas Isbell
Headquarters, Washington, DC
(Phone: 202/358-1547)

Ray Villard
Space Telescope Science Institute, Baltimore, MD
(Phone: 410/338-4514)

Dave Drachlis
Marshall Space Flight Center, Huntsville, AL
(Phone: 205/544-0034)

April 1, 1997

RELEASE: 97-63

HUBBLE TRACKS THE FADING OPTICAL COUNTERPART OF A GAMMA-RAY BURST

NASA's refurbished Hubble Space Telescope has made an important contribution toward solving one of astronomy's greatest enigmas by allowing astronomers to continue watching the fading visible-light counterpart of a gamma-ray burst (GRB), one of the most energetic and mysterious events in the universe.

The so-called optical counterpart is presumably a cooling fireball from the catastrophic event that triggered the massive burst of invisible gamma rays -- the highest-energy radiation in the universe. This event may have unleashed as much energy in a few seconds as the Sun does in ten billion years.

The burst was detected by several space-based, high-energy astrophysics observatories on Feb. 28. The visible GRB counterpart, the first ever detected, was then discovered in a pair of ground-based telescopic images of the region where the burst occurred. Taken a week apart, the later picture showed that an object that could be seen in the first image had disappeared in the field, suggesting it was the decaying fireball from the event. A week after that discovery, astronomers at the New Technology Telescope and the Keck telescope identified an extended source at the location of the suspected GRB.

-more-

Hubble's high resolution and sensitivity were brought in to hunt down the rapidly dimming fireball -- plunging from 21st to below 23rd magnitude in eight days -- after it had grown so faint that it could not be resolved by ground-based telescopes by March 13. On March 26, Hubble allowed astronomers to reacquire the lost remnant and continue following the behavior of the fading source. The Hubble observation clearly shows that the visible GRB source has two components: a point-like object and an extended feature.

This observation demonstrates Hubble's unique capability for monitoring the aftermath of gamma-ray bursts, long after they have faded from the view of Earth-based telescopes. And there will be no shortage of targets: once a day, a gamma-ray burst occurs somewhere in the universe.

"Now we know that, at least in some cases, we can follow the aftermath of GRBs for several weeks, using a coordinated effort between ground-based telescopes, Hubble and other spacecraft," said Kailash Sahu, leader of a team of scientists at The Space Telescope Science Institute, Baltimore, MD, who used Hubble to resolve the fading GRB remnant. "The fact that we were able to resolve the extended feature and measure its brightness separately provides us with an unprecedented opportunity to solve the mystery of these enigmatic objects," added team member Mario Livio. A scientific paper on the team's findings has been submitted to the journal Nature.

A much anticipated second observation with Hubble, scheduled for April 7, should help clarify the nature of the extended feature and place meaningful constraints on theories about the mechanism behind these extraordinary detonations. Hubble also may provide an answer to the question of whether GRBs originate in our Milky Way galaxy, or come from far more energetic events scattered at cosmological distances across the far reaches of the universe.

If Hubble's follow-up observations show the extended object adjoining the GRB has not faded, it is probably related to a host galaxy. This would confirm the notion that GRBs are cosmological in origin, far removed from Earth in space and time. Any measurable fading would present the startling alternative that the extended object is a cloud of gas illuminated by a GRB source within our own Milky Way.

"This opens up a whole new era in gamma-ray burst research. We now know that it is possible to see the fading optical emission by rapid follow-up observations with powerful telescopes. With several more of these, we should be able to narrow the models of what could be causing these gigantic outbursts," said Gerald Fishman of the Marshall Space Flight Center, Huntsville, AL, a principal investigator on NASA's Compton Gamma Ray Observatory.

Hubble's contribution to solving the GRB mystery is the latest in a series of extraordinary ground- and spacecraft-based observations, across the electromagnetic spectrum, that has carried astronomers on a fast-paced detective hunt for the mechanism powering the most energetic and elusive events in the universe.

"Hubble's unmatched ability to see the faintest traces of the universe is helping solve one of astronomy's most perplexing unsolved problems," said Robert Williams, director of The Space Telescope Science Institute, who provided some of his discretionary time for the observation. "This has been a textbook example of the importance of coordinated telescope observations," he said.

Although more than 2,000 separate GRBs have been catalogued as they randomly occur across the sky, the outbursts have perplexed astronomers for more than two decades. This is because the source of a GRB had never been seen until a team of astronomers led by Jan van Paradijs of the University of Alabama in Huntsville, and the University of Amsterdam, found a diffuse object at the location of a gamma ray burst using a 4.2-meter telescope at La Palma Observatory in the Canary Islands.

The burst had been detected by the Gamma-Ray Burst Monitor aboard the Italian-Dutch BeppoSAX satellite. Within eight hours after the burst was detected, the BeppoSAX spacecraft was maneuvered to point its more precise X-ray imaging instruments at the location. Hubble observing time was then set aside to allow astronomers to take images with Hubble's Wide Field Planetary Camera 2 which clearly show a point-like source, at 25.7 magnitude, and the extended object.

The raw data from the Hubble image has been posted to the Internet at the following URL:

http://wwwssl.msfc.nasa.gov/newhome/headlines/ast31mar97_1.htm

-end-

News Release

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release

Douglas Isbell
Headquarters, Washington, DC
(Phone: 202/358-1753)

April 4, 1997

Jane Platt
Jet Propulsion Laboratory, Pasadena, CA
(Phone: 818/354-5011)

NOTE TO EDITORS: N97-25

LATEST IMAGES OF ICY EUROPA AND DEBATE OVER SURFACE AGE TO BE FEATURED IN APRIL 9 GALILEO BRIEFING

New images of Europa from NASA's Galileo mission and related animation supporting the theory that the icy moon of Jupiter may have a subsurface ocean will be presented at a press briefing on Wednesday, April 9, at 2 p.m. EDT. The briefing will originate from NASA's Jet Propulsion Laboratory, Pasadena, CA, and will be carried live on NASA Television.

The latest images were taken during Galileo's closest flyby of Europa on Feb. 20, 1997, when the spacecraft came within 363 miles of the Jovian moon and took very high resolution images of features in regions never before studied.

The tantalizing new images and data indicate Europa has a thin ice crust covering either liquid water or slush. Scientists are intrigued by the prospect that a slushy concoction of chemicals in this region could nurture life. The briefing will include outside experts raising the possibility that Europa's oceans may contain thermal vents, sea ice and other phenomena found on Earth.

The estimated age of Europa's surface also will be discussed, with controversial new information leading some scientists to conclude the surface is much younger than previously believed. As evidence of that, images will be shown of relatively smooth, crater-free areas.

NASA Television is available through GE-2, Transponder 9C at 85 degrees West longitude, vertical polarization, with a frequency of 3880 Mhz, and audio of 6.8 Mhz. The new images of Europa will be released on the Galileo Internet home page at the following URL:

http://www.jpl.nasa.gov/galileo/

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

Donald Savage
Headquarters, Washington, DC
(Phone: 202/358-1547)

For Release

April 8, 1997

Allen Kenitzer
Goddard Space Flight Center, Greenbelt, MD
(Phone: 301/286-2806)

Barbara McGehan
National Oceanic and Atmospheric Administration, Boulder, CO
(Phone: 303/497-6288)

RELEASE: 97-64

LOW OZONE MEASURED OVER NORTH POLE

Unusually low levels of ozone over the Arctic were measured during March by satellite-based monitoring instruments operated by NASA and the National Oceanic and Atmospheric Administration (NOAA).

"These are the lowest ozone values ever measured by the TOMS instruments during late-March and early-April in the Arctic," said TOMS Project Scientist, Dr. Pawan K. Bhartia, of NASA's Goddard Space Flight Center (GSFC), Greenbelt, MD. "However, these low ozone amounts are still nearly a factor of two greater than the lowest values seen by TOMS in the Antarctic during Southern hemisphere Spring."

Centered in a stable, nearly circular region over the North Pole, the average March 1997 ozone amounts were 40 percent lower than the average March amounts observed between 1979 and 1982. This follows ozone amounts in March 1996 that were 24 percent lower than the 1979-82 average, although this low was off center of Earth's pole toward the North Atlantic.

The minimum in total column ozone fell to 219 Dobson units on March 24, 1997, from values near 280 units earlier in March. Two NASA Total Ozone Mapping Spectrometer (TOMS) instruments, one aboard NASA's Earth Probe (TOMS-EP) satellite and the other aboard Japan's Advanced Earth Observing Satellite (ADEOS) made the measurements of the rapid decrease, supported by similar data from the Solar Backscatter Ultraviolet instruments aboard the NOAA-9 and NOAA-14 satellites.

The Halogen Occultation Experiment (HALOE) aboard NASA's Upper Atmosphere Research Satellite (UARS) measured vertical distributions of ozone that confirm these low Arctic values. On March 26, HALOE measured a very low ozone concentration of less than one part per million of ozone (normal concentrations are near 3-4 parts per million) at an altitude of 12.4 miles slightly northeast of Hudson's Bay.

-more-

Over the Alaskan Arctic, where NOAA monitors ozone from the surface at Barrow, Alaska, March average ozone was about 375 Dobson units, slightly below the March average for the past ten years of 413 Dobson units, according to David Hofmann, Director of NOAA's Climate Monitoring and Diagnostics Laboratory in Boulder, CO. "On March 17 and 18 ozone dipped to values below the 300 Dobson unit range when the edge of the low ozone region extended to the latitude of Barrow (71 degrees north)," he said. "This is not a typical occurrence and indicates the unusual conditions this year."

"The unusual meteorological conditions played a significant role in the March ozone lows," according to Paul A. Newman of the GSFC. "The reason or reasons behind these unusual stratospheric weather patterns are unclear, and figuring out why this pattern occurred will be a significant component of our further research efforts."

Furthermore, measurements from balloon-based ozone instruments operated by Environment Canada and launched from Eureka (80 degrees North latitude) and Resolute Bay (75 degrees North) reveal 60 percent ozone losses between the altitudes of 6.2-15.5 miles during March, in comparison to historical March observations.

The TOMS data show that the region of low ozone amounts below 280 DU exceeded 5.3 million square kilometers, covering a substantial fraction of the Arctic region. These low ozone amounts are found inside the Arctic polar vortex, a part of the stratospheric circumpolar jet stream.

The 1996/1997 winter polar vortex has been unusually strong and persistent into March. Data from NOAA's Climate Prediction Center show cold temperatures low enough to form polar stratospheric clouds during late March. These clouds, common in January and February but rare in late March, helped convert certain forms of stratospheric chlorine into forms which are highly reactive to ozone destruction. The combination of reactive chlorine compounds and sunlight from the March rising sun at polar latitudes leads to destruction of ozone.

The most recent observations indicate that temperatures had become too warm by March 30 for polar stratospheric clouds to form. In addition, the minimum ozone amounts in the Arctic have begun to slowly increase from the unusually low March amounts, and the area covered by the low has begun to decrease.

"The appearance of this well-defined region of low ozone is consistent with our expectations following detailed chemical analyses of the Arctic winter stratosphere in early 1989 and 1992," said Dr. Michael Kurylo, manager of NASA's Upper Atmosphere Research Program, which organized those airborne experiments. "The persistence of such cold temperatures within the Arctic vortex well into the sunlit period is an essential ingredient for driving many of the chemical cycles for ozone destruction. We will now be examining these low ozone air masses into their recovery period using our best satellite and airborne instruments."

An international treaty on ozone-depleting substances is leading to reductions in their concentrations in the atmosphere and hence to reduced chlorine levels in the stratosphere. As we move into the next century, chlorine-catalyzed ozone losses resulting from CFCs and other chlorine-containing species will be reduced.

Ozone, a molecule made up of three atoms of oxygen, absorbs harmful ultraviolet radiation from the Sun. Most atmospheric ozone is found in a thin layer between 6-18 miles. A Dobson unit is related to the physical thickness of the ozone layer if it could be brought down to the Earth's surface. The global average ozone layer thickness is 300 Dobson units, which equals 1/8th of an inch, approximately the thickness of two stacked pennies. In contrast, the ozone layer thickness in the Antarctic ozone hole is about 100 Dobson units (1/25th of an inch), approximately the thickness of a single dime.

TOMS ozone data and pictures from March 1997 are available on the Internet at the following URL:

http://jwocky.gsfc.nasa.gov or through links on: http://pao.gsfc.nasa.gov/

TOMS-EP, ADEOS, and UARS, and the aircraft, balloons and ground-based ozone-measurement programs are key parts of a global environmental effort which includes NASA's Mission to Planet Earth, a long-term, coordinated research effort to study the Earth as a global environmental system.

The TOMS instruments are managed by Goddard. The HALOE instrument is managed by NASA's Langley Research Center, Hampton, VA. NOAA-9 and NOAA-14 are managed by the NOAA National Environmental Satellite, Data, and Information Service, Suitland, MD.

- end -

News Release

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release

Debra Rahn
Headquarters, Washington, DC
(Phone: 202/358-1639)

April 9, 1997

Rob Navias
Johnson Space Center, Houston, TX
(Phone: 281/483-8651)

NOTE TO EDITORS: N97-26

LINENGER NEWS CONFERENCE SET

U.S. astronaut Jerry Linenger will hold a news conference from the Russian space station Mir on Friday, April 11 at approximately 9 a.m. EDT. The news conference, which will be audio only, will last about 15 minutes and will be broadcast live on NASA Television with two-way question and answer capability for reporters at participating NASA centers.

The news conference will be transmitted through Russian ground stations. Due to time constraints, reporters will be limited to one question each with the possibility of follow-up questions as time allows.

Linenger, who is now almost three months into his four-month research mission, became a Mir crew member in January, following the docking of the Shuttle Atlantis to the Mir during the STS-81 mission. Linenger will return to Earth in May with the STS-84 astronauts, following Atlantis' docking to the Mir to deliver astronaut Mike Foale for the start of his four-month tour of duty.

NASA Television is carried on a new satellite, GE-2, Transponder 9C at 85 degrees West longitude, vertical polarization, frequency 3880 Mhz, audio 6.8 Mhz.

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Video Advisory

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release
April 9, 1997

Deanna Corridon
Headquarters, Washington, DC
(Phone: 202/358-1733)

VIDEO ADVISORY: V97-30

LOW OZONE LEVELS FOUND OVER THE NORTH POLE; SOLAR EJECTION ON NTV

Featured on NASA Television Wednesday, animation developed from data collected by satellite-based instruments operated by NASA and the National Oceanic and Atmospheric Administration (NOAA) depict unusually low levels of ozone in the Arctic. The Video File also will include images taken from the NASA-European Space Agency Solar Heliospheric Observatory (SOHO) observing a mass coronal ejection from the Sun on April 7.

New images of Europa from NASA's Galileo mission and animation supporting the theory that the icy moon of Jupiter may have a subsurface ocean will be presented at a press briefing today, April 9, at 2:00 p.m. EDT and will be replayed on Video File.

ITEM #1: LOW ARCTIC OZONE LEVELS DURING MARCH, 1997
Animation shows low levels of Ozone over the Arctic. Higher levels are shown in red. Lower levels in purple.

ITEM #2: OZONE PROTECTS THE EARTH
Animation depicting how ozone protects the Earth from ultraviolet radiation.

ITEM #3: OZONE DEPLETION
Animation illustrating ozone depletion.

ITEM #4: ANIMATION OF TOMS SATELLITE
Observations taken by Total Ozone Mapping Spectrometer (TOMS) instruments onboard NASA's Earth Probe (TOMS-EP) Satellite & Japan's Advanced Earth Observing Satellite (ADEOS).

ITEM #5: DR. PAUL NEWMAN B-ROLL
B-roll of Newman looking at TOMS data.

ITEM #6: INTERVIEW - DR. PAUL NEWMAN, ATMOSPHERIC PHYSICIST, GODDARD SPACE FLIGHT CENTER
Explains the significance of the low levels of Arctic Ozone. *For more information contact Doug Isbell at (202) 358-1753 or Allen Kenitzer at (301) 286-2806.*

ITEM #7: SOHO OBSERVES A SOLAR EJECTION
Images taken by the SOHO spacecraft on April 7.

Video news file today at noon, 3, 6, 9 p.m. and midnight EST.

NTV is available on GE-2, transponder 9C at 85 degrees West longitude, vertical polarization, with a frequency of 3880 MHz, and audio of 6.8 MHz.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Michael Braukus
Headquarters, Washington, DC
(Phone: 202/358-1979)

April 9, 1997

James Hartsfield
Johnson Space Center, Houston, TX
(Phone: 281/483-5111)

RELEASE: 97-65

NASA REVISES INTERNATIONAL SPACE STATION SCHEDULE

NASA will begin its on-orbit assembly of the International Space Station (ISS) no later than October 1998, and is looking at options that will allow the Agency to work around the delay caused by the late arrival of a key station module.

"We knew from the outset that building an International Space Station was going to be tremendously challenging. Space exploration is not easy or predictable," said NASA Administrator Daniel S. Goldin. "We will work through this schedule issue, and we undoubtedly will face additional problems in the future. But we are well on our way to the realization of this world-class facility," he said.

The on-orbit assembly of the International Space Station originally was scheduled to begin in November 1997 with the launch of the NASA-financed/Russian-built and launched Functional Cargo Block (FGB). Inadequate funding by the Russian government to the Russian Space Agency (RSA) and its contractors for building another key station element -- the Service Module (SM) -- has put construction up to eight months behind schedule.

NASA managers and engineers have been reviewing various options to mitigate the impact to the ISS program of the current schedule slip of the Service Module, and to begin the steps necessary to mitigate the impact of potential additional Russian delays. RSA has been a joint participant in the effort to identify these steps. Options under consideration are:

- Modify the FGB to allow for on-orbit refueling and upgrade of its avionics capability. These changes will give the FGB the capability to augment the early control and reboost capabilities to protect for a Service Module delay.

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- Develop an Interim Control Module (ICM) in conjunction with the Naval Research Laboratory to provide reboost capability and attitude control in the event that the SM experiences further delays, or propellant storage/reboost capability if the SM is launched on time.
- Consider the installation of life support systems in the U.S. lab to allow early human presence on the ISS.
- Define options involving the ICM to provide the functions of a permanent propulsion module in order to complement Russian logistics capability and to provide roll control to replace or complement the Russian Science Power Platform functions.

NASA will determine the timing for decisions which need to be made in the event that Russia is unable to provide its agreed contributions to the ISS program. These decision points will be selected to allow for the timely provision of an alternative capability.

NASA has begun initial steps at the working level to accommodate changes to the Space Shuttle manifest. NASA has reassigned the Space Shuttle Endeavour to fly the September 1997 STS-86 mission to the Mir space station instead of the Space Shuttle Atlantis. This change will allow Atlantis to begin its scheduled orbiter maintenance down period several months earlier, while permitting Endeavour a mission prior to flying the first ISS assembly flight in July 1998.

Additional adjustments to the remainder of the assembly sequence will be worked in consultation with the other International Partners and research community over the next several weeks.

- end -

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National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Donald Savage
Headquarters, Washington, DC
(Phone: 202/358-1547)

April 9, 1997

Jane Platt
Jet Propulsion Laboratory, Pasadena, CA
(Phone: 818/354-5011)

RELEASE: 97-66

NEW IMAGES HINT AT WET AND WILD HISTORY FOR EUROPA

Chunky ice rafts and relatively smooth, crater-free patches on the surface of Jupiter's frozen moon Europa suggest a younger, thinner icy surface than previously believed, according to new images from Galileo's spacecraft released today.

The images were captured during Galileo's closest flyby of Europa on Feb. 20, 1997, when the spacecraft came within 363 miles of the Jovian moon. These features, which lend credence to the idea of hidden, subsurface oceans, also are stirring up controversy among scientists who disagree about the age of Europa's surface.

Dr. Ronald Greeley, an Arizona State University geologist and Galileo imaging team member, said the ice rafts reveal that Europa had, and may still have, a very thin ice crust covering either liquid water or slush.

"We're intrigued by these blocks of ice, similar to those seen on Earth's polar seas during springtime thaws," Dr. Greeley said. "The size and geometry of these features lead us to believe there was a thin icy layer covering water or slushy ice, and that some motion caused these crustal plates to break up."

"These rafts appear to be floating and may, in fact, be comparable to icebergs here on Earth," said another Galileo imaging team member, Dr. Michael Carr, a geologist with the U.S. Geological Survey. "The puzzle is what causes the rafts to rotate. The implication is that they are being churned by convection."

The new images of Europa's surface also have sparked a lively debate among scientists. Galileo imaging team member Dr. Clark Chapman is among those who believe the smoother regions with few craters indicate Europa's surface is much younger than previously believed. In essence, Chapman, a planetary scientist at Southwest Research Institute, Boulder, CO, believes the fewer the craters, the younger the region. Clark based his estimate on current knowledge about cratering rates, or the rate at which astronomical bodies are bombarded and scarred by hits from comets and asteroids.

-more-

"We're probably seeing areas a few million years old or less, which is about as young as we can measure on any planetary surface besides Earth," said Chapman. "Although we can't pinpoint exactly how many impacts occurred in a given period of time, these areas of Europa have so few craters that we have to think of its surface as young."

Chapman added, "Europa's extraordinary surface geology indicates an extreme youthfulness – a very alive world in a state of flux."

However, Carr sees things differently. He puts Europa's surface age at closer to one billion years old.

"There are just too many unknowns," Carr said. "Europa's relatively smooth regions are most likely caused by a different cratering rate for Jupiter and Earth. For example, we believe that both Earth's moon and the Jovian moon, Ganymede, have huge craters that are 3.8 billion years old. But when we compare the number of smaller craters superimposed on these large ones, Ganymede has far fewer than Earth's moon. This means the cratering rate at Jupiter is less than the cratering rate in the Earth-moon system."

Scientists hope to find answers to some of the questions surrounding Europa and its possible oceans as the Galileo spacecraft continues its journey through the Jovian system.

"We want to look for evidence of current activity on Europa, possibly some erupting geysers," Greeley said. "We also want to know whether Europa's surface has changed since the Voyager spacecraft flyby in 1979, or even during the time of the Galileo flybys."

The craft will return for another Europa flyby on Nov. 6, 1997, the final encounter of Galileo's primary mission. However, eight more Europa flybys are planned as part of Galileo's two-year extended mission, which also will include encounters with two other Jovian moons, Callisto and Io.

The Jet Propulsion Laboratory manages the Galileo mission for NASA's Office of Space Science, Washington, DC.

Images and other data received from Galileo are posted on the Galileo mission home page on the World Wide Web at URL:

http://www.jpl.nasa.gov/galileo.

NOTE TO EDITORS: Stills and animation of the Galileo spacecraft are available by calling the JPL Public Information Office at 818/354-5011.

- end -

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Donald Savage
Headquarters, Washington, DC
(Phone: 202/358-1547)

April 9, 1997

Jim Sahli
Goddard Space Flight Center, Greenbelt, MD
(Phone: 301/286-0697)

Barbara McGehan
NOAA, Boulder, CO
(Phone: 303/497-6288)

RELEASE: 97-67

SOLAR STORM SPOTTED BY SPACECRAFT

A large eruption on the Sun was detected at 10 a.m. EDT, on Monday, April 7 by the Solar and Heliospheric Observatory (SOHO) spacecraft, and scientists say the ejected matter, traveling through space as a so-called interplanetary magnetic cloud, is likely to reach the Earth at 8 p.m. EDT today. The storm is large in size; however, it is moderate in strength compared to many others that have reached the Earth in the past.

Although the SOHO findings are of interest to scientists, the National Oceanic and Atmospheric Administration Space Environment Center (SEC), provider of official government forecasts, has predicted, based on "classical indicators," that the solar storm will be an ordinary event and pose no danger to the population at large.

SEC notes the absence of energetic solar particles which would be expected to accompany a strong solar storm. Such particles, if present, can increase radiation levels for astronauts and cosmonauts in orbit. "We are forecasting an event with conditions below the threshold of concern for most of our users," said Dr. Ernie Hildner, head of the Space Environment Center.

The center of the storm will miss the Earth, but it could be broad enough to affect the Earth's space environment and could cause increased auroral activity (Northern and Southern lights) at high latitudes. In the past, some solar storms have affected spacecraft in orbit, shortwave communications and electric power grids.

-more-

SOHO, a joint project of NASA and the European Space Agency, is positioned about 900,000 miles sunward of the Earth. The spacecraft has a continuous telescopic view of the Sun and also is equipped with sensors to sample solar particles as they sweep past. A vast network of satellites, space probes, and ground sensors, part of the International Solar Terrestrial Physics (ISTP) program, is monitoring the approaching interplanetary storm and preparing to observe its possible effects on the Earth's space environment.

The solar eruption, called a coronal mass ejection, was first spotted by Shane Stezelberger, a ground controller with SOHO's Large Angle Coronagraph and Spectrometer (LASCO) team at the SOHO Experiment Operations Facility at NASA's Goddard Space Flight Center in Greenbelt, MD. "I knew it was a big one when I saw it," said Stezelberger, a recent graduate of Virginia Polytechnic Institute and State University in Blacksburg. He promptly notified SOHO scientists, including Dr. Barbara Thompson, whose immediate reaction was "Wow." Dr. Donald Michels of the U.S. Naval Research Laboratory said, "We've never before seen one headed directly at Earth that was as big and bright, and loaded with complex details, as this one." SOHO was launched on Dec. 2, 1995.

"The eruption seemed to blow open a hole in the Sun's corona that had opened and then healed previously," said Dr. Thompson, who is a physicist with SOHO's Extreme-Ultraviolet Imaging Telescope (EIT) team. Accompanying the coronal mass ejection was a powerful solar flare explosion, according to Dr. Arthur Poland, NASA's SOHO Project Scientist. "The flare triggered a supersonic wave that swept through the corona like a tsunami on the surface of the sea," Dr. Poland said.

A sensor called the WAVES experiment on NASA's WIND satellite, positioned near the SOHO, detected bursts of radio emissions from high speed electrons associated with the explosion, also beginning at about 10 a.m. EDT Monday.

The interplanetary storm, traveling toward Earth at a speed of over 1,500,000 miles per hour, is expected to pass the WIND and SOHO satellites at about 7 p.m. EDT Wednesday, and to strike the Earth's magnetosphere an hour later, according to Dr. Nicola Fox, Global Geospace Science program coordinator at Goddard. At that time, according to her projections, the Geotail satellite, a joint Japanese-NASA spacecraft that is part of the ISTP program, will be passing through the center of the Earth's magnetic tail, on the side opposite the Sun. "Geotail will be ideally positioned to observe storm activity like dipolarizations and bursty bulk flows of plasma," she added. Plasma is the scientific term for electrified gas.

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NASA's Earth-orbiting POLAR satellite will train its battery of visible, ultraviolet and X-ray cameras on the north and south polar regions of the Earth to observe "a likely considerable enhancement of the aurora," said Dr. Robert Hoffman, POLAR Project Scientist. And, with other POLAR onboard sensors, "we'll look for possible large increases in the intensity of the radiation belts." The likely impact of the interplanetary cloud on the magnetosphere could be to compress it, driving the radiation belts closer to the Earth, as occurred in January after a smaller coronal mass ejection lifted off the Sun on Jan. 6.

Analysis of the spacecraft and ground sensor data on this week's solar storm and its effects on the Earth should lead to a better understanding of the basic physical processes involved and how such disturbed conditions of "space weather" can be predicted.

Spectacular images of this solar storm from SOHO's LASCO and EIT instruments are available from Goddard Public Affairs at 301/286-0697. The images also are available on the internet at:

http://pao.gsfc.nasa.gov/gsfc/newsroom/flash/flash.htm

Space Environment Center's official forecast and much more information about space weather are available at:

http://www.sec.noaa.gov

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Video Advisory

National Aeronautics and
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Washington, DC 20546
(202) 358-1600

For Release
April 10, 1997

Deanna Corridon
Headquarters, Washington, DC
(Phone: 202/358-1733)

VIDEO ADVISORY: V97-31

X-33 MODELS SOAR IN WIND TUNNELS ON NTV

Featured on NASA Television Thursday, scale models of the next generation of space transportation, a Reusable Launch Vehicle (RLV), are undergoing wind tunnel testing at NASA's Langley Research Center (LaRC), Hampton, VA. The models are being tested in an effort to develop a spacecraft that would provide faster and cheaper access to space. Included in today's Video File will be images taken from the NASA-European Space Agency Solar Heliospheric Observatory (SOHO) observing a mass coronal ejection; animation developed from data collected by satellite-based instruments operated by NASA and the National Oceanic and Atmospheric Administration (NOAA) depicting unusually low levels of ozone in the Arctic; and images and animation of Europa from NASA's Galileo mission supporting the theory that the icy moon of Jupiter may have a subsurface.

ITEM #1: X-33 MODEL WIND TUNNEL TESTING
B-roll of a series of different scale models being tested in a half-dozen wind tunnels at LaRC.
ITEM #2: INTERVIEW - BILL SCALLION, AEROSPACE ENGINEER, NASA LANGLEY
ITEM #3: INTERVIEW - KELLY MURPHY, AEROSPACE ENGINEER, AEROTHERMODYNAMICS BRANCH
ITEM #4: INTERVIEW - ERIC ROBACK, RESEARCH ENGINEER, AEROTHERMODYNAMICS BRANCH
ITEMS #5-7: REPLAY - SOHO OBSERVES SOLAR EJECTION
ITEM #8: REPLAY - ONE-TWO PUNCH
ITEM #9: REPLAY - SOHO ANIMATION
ITEM #10: REPLAY - B-ROLL OF WORK IN SOHO OPERATIONS CENTER
ITEM #11: REPLAY - INTERVIEW - DR. ART POLAND, SOHO PROJECT SCIENTIST, NASA GODDARD SPACE FLIGHT CENTER
ITEM #12: REPLAY - INTERVIEW - DR. GUENTER BRUECKNER, NAVAL RESEARCH INSTITUTE
ITEM #13: REPLAY - LOW ARCTIC OZONE LEVELS DURING MARCH, 1997
ITEM #14: REPLAY - OZONE PROTECTS THE EARTH
ITEM #15: REPLAY - OZONE DEPLETION
ITEM #16: REPLAY - ANIMATION OF TOMS SATELLITE
ITEM #17: REPLAY - DR. PAUL NEWMAN B-ROLL
ITEM #18: REPLAY - INTERVIEW - DR. PAUL NEWMAN, ATMOSPHERIC PHYSICIST, GODDARD SPACE FLIGHT CENTER
ITEM #19: REPLAY - EUROPA IMAGES & ANIMATION

Video news file today at noon, 3, 6, 9 p.m. and midnight EDT.

NTV is available on GE-2, transponder 9C at 85 degrees West longitude, vertical polarization, with a frequency of 3880 MHz, and audio of 6.8 MHz.

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Video Advisory

National Aeronautics and
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April 11, 1997

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VIDEO ADVISORY: V97-32

SOFIA AIRBORNE OBSERVATORY ON NTV

Featured on NASA Television Friday, the next-generation airborne research laboratory, the Stratospheric Observatory For Infrared Astronomy (SOFIA), will be dedicated in an event today, April 11. SOFIA is a converted Boeing 747-SP aircraft that will be outfitted with a telescope and will fly in the Earth's stratosphere, viewing astronomical objects in the infrared region of the electromagnetic spectrum. NASA Television also will televise a series of spectacular Comet Hale-Bopp images taken by NASA photographers Bill Ingalls and Donna Felsenheld. Included in today's Video File will be a replay of scale models of the next generation of space transportation, a Reusable Launch Vehicle (RLV), undergoing wind tunnel testing at NASA's Langley Research Center (LaRC), Hampton, VA.

ITEM #1a-e: COMET HALE-BOPP BEAUTY SHOTS
Five recent images taken of the comet.

ITEM #2a: SOFIA ANIMATION
Animation depicting the SOFIA capturing images.

ITEM #2b: SOFIA HANGS OUT
B-roll of SOFIA in hanger.

ITEM #2c: INTERVIEW - CHRIS WILTSEE, SOFIA PROJECT MANAGER

ITEM #2d: INTERVIEW - DR. EDWIN ERICKSON, SOFIA PROJECT SCIENTIST

ITEM #2e: KUIPER OBSERVATORY
B-roll of the Kuiper Observatory which will be replaced by the SOFIA.

ITEM #2f: KUIPER B-ROLL
B-roll of the Kuiper Observatory taking off and flying.

ITEM #3a: REPLAY - X-33 MODEL WIND TUNNEL TESTING

ITEM #3b: REPLAY - INTERVIEW - BILL SCALLION, AEROSPACE ENGINEER, NASA LARC

ITEM #3c: REPLAY - INTERVIEW - KELLY MURPHY, AEROSPACE ENGINEER, AEROTHERMODYNAMICS BRANCH

ITEM #3d: REPLAY - INTERVIEW - ERIC ROBACK, RESEARCH ENGINEER, AEROTHERMODYNAMICS BRANCH

Video news file today at noon, 3, 6, 9 p.m. and midnight EDT.

NTV is available on GE-2, transponder 9C at 85 degrees West longitude, vertical polarization, with a frequency of 3880 MHz, and audio of 6.8 MHz.

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Video Advisory

National Aeronautics and
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Washington, DC 20546
(202) 358-1600

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April 15, 1997

Deanna Corridon
Headquarters, Washington, DC
(Phone: 202/358-1733)

VIDEO ADVISORY: V97-33

ENHANCING THE SHUTTLE ON NTV

Featured on NASA Television Tuesday, NASA begins preliminary testing of an enhanced Shuttle Main engine called Block IIA, which will be more reliable and less expensive to operate than the current engine. NASA plans to fly three Block IIA engines on STS-89 aboard the Space Shuttle Discovery, scheduled to launch Jan. 15, 1998.

ITEM #1a: ENHANCED ENGINE TESTING

B-roll of the enhanced Space Shuttle Main Engine, Block IIA, being tested at the Stennis Space Center (SSC).

ITEM #1b: INTERVIEW - DAVE GEIGER, RESIDENT MANAGER OF ROCKETDYNE AT SSC

Geiger discusses engine testing. *For more information contact Lanee Cobb at (601) 688-3341.*

Video news file today at noon, 3, 6, 9 p.m. and midnight EDT.

NTV is available on GE-2, transponder 9C at 85 degrees West longitude, vertical polarization, with a frequency of 3880 MHz, and audio of 6.8 MHz.

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News Release

National Aeronautics and
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Washington, DC 20546
(202) 358-1600

For Release

Brian Welch
Headquarters, Washington, DC
(Phone: 202/358-1600)

April 16, 1997

RELEASE: 97-68

NASA AND AIR FORCE SPACE COMMAND ANNOUNCE COOPERATIVE EFFORTS

NASA and the Air Force Space Command have agreed to work together in several areas of mutual interest in the hopes of saving both organizations costs and sharing in new technologies to benefit future spaceflight and spacecraft.

"This agreement exemplifies NASA's commitment to finding ways to reduce cost and, where appropriate, share our assets with the Air Force for greater efficiencies in our respective missions," said NASA Administrator Daniel S. Goldin.

Under the terms of the agreement signed by Goldin and Air Force Space Commander General Howell M. Estes, III, NASA and the Air Force will form partnership teams to study seven areas of potential cooperation. These areas include studying the cost feasibility of launching Defense Support Program satellites from the Space Shuttle in 1999; possible expanded use of the Shuttle for Air Force technology payloads; and consolidating plans that outline space transportation needs of NASA and the Air Force.

NASA and the Air Force also will examine their respective infrastructures and common-use facilities; develop and coordinate an implementation plan to address orbiting space debris; and possible collaboration on the Clementine II project; and expand cooperation in space weather environment research and data sharing.

The partnership teams are scheduled to provide an interim report on their findings to senior management of both organizations in mid-July of this year.

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Video Advisory

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

Deanna Corridon
Headquarters, Washington, DC
(Phone: 202/358-1733)

For Release
April 17, 1997

VIDEO ADVISORY: V97-34

STUDENT EXPLORERS ON NTV

Featured on NASA Television Thursday, twenty-four teams of undergraduate students "float" through class aboard a NASA KC-135A research aircraft during a two-week program in April. NASA Television also will include B-roll of college and high school students putting their engineering skills to the test by preparing for the 4th Annual Great Moon Buggy Race in Huntsville, AL on April 19. The students are designing and building their own versions of the "moon buggy" that will be raced on a track simulating the lunar surface.

ITEM #1: REPLAY - FLOATING STUDENTS

B-roll of experiment preparation, suit-up, and on-board activities. *For more information contact Beth Schmid at (202) 358-1760 or Ed Campion at (281) 483-5111.*

ITEM #2a: AND THEY'RE OFF AGAIN!!!

Footage includes clips from the 3rd Annual Great Moon Buggy Race in 1996.

ITEM #2b: INTERVIEW - DR. JIM DOWDY, MOON BUGGY RESEARCH COORDINATOR, MSFC

Discusses the obstacles that contestants face. *For more information contact Beth Schmid at (202) 358-1760 or Jerry Berg at (205) 544-6540.*

Video news file today at noon, 3, 6, 9 p.m. and midnight EDT.

NTV is available on GE-2, transponder 9C at 85 degrees West longitude, vertical polarization, with a frequency of 3880 MHz, and audio of 6.8 MHz.

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News Release

National Aeronautics and
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For Release

April 17, 1997

Beth Schmid
Headquarters, Washington, DC
(Phone: 202/358-1760)

Sally V. Harrington
Lewis Research Center, Cleveland, OH
(Phone: 216/433-2037)

RELEASE: 97-69

NASA'S LEWIS RESEARCH CENTER DONATES COMPUTERS TO EMPOWERMENT ZONE SCHOOLS

Computers originally used by engineers and researchers at NASA's Lewis Research Center, Cleveland, OH, now will be used by students attending schools in the Cleveland Empowerment Zone (EZ).

Lewis officially donated 100 computers to be distributed among ten schools in the EZ at a ceremony today attended by Cleveland Mayor Michael R. White and Cleveland Public Schools Superintendent Richard Boyd.

"These computers will open windows to another world for our children and will help teachers prepare our kids for an ever changing future," said Mayor White. "Late last year NASA signed an agreement with our Empowerment Zone. Today we are seeing the fruits of that agreement. NASA recognizes that there is nothing more important than giving our children the best educational opportunities possible."

The donation of computers by Lewis was made possible by the Stevenson-Wydler Act, which enables educational institutions or nonprofit organizations to receive excess laboratory equipment from federal laboratories for the purpose of technical and scientific education and research activities.

"Lewis is committed to support Cleveland's 'strategic vision for change,'" said Donald J. Campbell, director of the Lewis Research Center. "These computers will provide technology to educate the young minds that will carry that vision into the next century."

"It is a constant challenge to provide all of our students with computers and the latest high-tech teaching tools necessary for a modern education," Superintendent Boyd said. "Thanks to a little forethought by NASA's leadership, hundreds of students will use these computers to improve their reading and math skills. I hope other companies will follow NASA's example as they upgrade to more advanced technology."

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"The agreement that we signed with NASA targeted science and mathematics education for school students living in the Empowerment Zone," said Mayor White. "Empowerment Zone children will benefit from these computers. However, the ultimate beneficiary of this partnership with NASA is the City of Cleveland as we strengthen our ability to compete in the next century."

The following schools have been targeted to receive computers: Marion Sterling, Charles Orr, Miles Standish, Charles Lake, Wilson, St. Adelbert, John Raper, Daniel E. Morgan, Louis Pasteur, Martin Luther King, Mary B. Martin. Each school will receive up to ten 386-based computers according to need.

Cleveland's Empowerment Zone consists of the Fairfax, Glenville, Hough and Midtown Corridor neighborhoods.

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News Release

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release

Beth Schmid
Headquarters, Washington, DC
(Phone: 202/358-1760)

April 17, 1997

Jerry Berg
Marshall Space Flight Center, Huntsville, AL
(Phone: 205/544-0034)

RELEASE: 97-70

STUDENTS TEST ENGINEERING SKILLS IN FOURTH "GREAT MOON BUGGY RACE"

The same spirit of ingenuity that produced NASA's Lunar Roving Vehicle is back at work as college and high school students from around the country prepare for the 4th Annual "Great Moon Buggy Race" in Huntsville, AL.

Students will put their engineering skills to the test by designing, building and racing their versions of the "moon buggy" on a track simulating the lunar surface. Teams representing 16 colleges and high schools will compete beginning at 11 a.m. EDT on Saturday, April 19 at the U.S. Space and Rocket Center in Huntsville.

Competitors will race in the shadow of a giant Saturn V, like the rocket that boosted NASA's lunar rover to the Moon, and a full-size Space Shuttle mock-up. The one-half mile race course is speckled with "lava ridges," "craters" and sandpits -- simulating the lunar surface -- as it winds through the Rocket Center's grounds.

This year's moon buggy race is sponsored by NASA's Marshall Space Flight Center -- where the lunar roving vehicle and the Saturn V were designed and developed. The moon buggy helped astronauts explore their landing sites on the Moon during the Apollo 15, 16 and 17 missions.

"The fascinating thing I see over and over is the students' interest in space," said Jim Dowdy, moon buggy competition coordinator at Marshall. "They go for anything that's connected to the space program. The competition enhances awareness of human exploration and development of space."

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Each two-member team will race its human-powered buggy, piloted by one male and one female student. After a safety inspection of each vehicle, the competition will begin when the two crew members carry their moon buggy a distance of 20 feet and place it at the starting line.

Once the signal comes that the event clock is ticking, the crews will unfold and assemble their moon buggies from a bin no larger than a 4-foot cube and race around the course. The event clock will stop when the vehicle and its crew cross the finish line. Prizes will be awarded to the top three finishers. The top prize is a trip to Kennedy Space Center in Florida to watch a Space Shuttle launch. A prize also will be awarded to the buggy judged to be the "best" design from an original, creative concept and offering the best technical solution to navigating on a planetary surface.

Teams scheduled to compete in the race are from Arizona State University (Tempe); Auburn University (Auburn, AL); North Dakota State (Fargo); Ozark Community College (Springfield, MO); Pittsburg State University (Pittsburg, KS); Trenton State College (Trenton, NJ); University of Alabama in Huntsville; University of Evansville (Evansville, IN); University of Florida (Gainesville); University of Puerto Rico (Humacao); University of Vermont (Burlington); University of California (Santa Barbara); and the University of Tennessee (Knoxville).

There are three entries in the high school division: Bob Jones High School (Huntsville, AL); Monterey High School (Monterey, LA); and Autauga County Vocational Center (Prattville, AL).

Other sponsors of the event include the American Institute of Aeronautics and Astronautics, Washington, DC, and the U.S. Space and Rocket Center, Huntsville, AL.

Note to Editors: Satellite feeds consisting of moon buggy B-roll and team member interviews gathered during the race will be available the afternoon of April 19, beginning at approximately 3:30 p.m. EDT. If there are questions about the video feed, please call Connie James of Marshall TV at 205/544-3234. The video will be transmitted on the GE-2 satellite, transponder 9C, at 85 degrees West longitude, with a frequency of 3880 MHz, and audio on 6.8 MHz.

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News Release

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(202) 358-1600

For Release

Douglas Isbell
Headquarters, Washington, DC
(Phone: 202/358-1753)

April 17, 1997

Lynn Chandler
Goddard Space Flight Center, Greenbelt, MD
(Phone: 301/286-9016)

RELEASE: 97-71

PLANT GROWTH IN NORTHERN LATITUDES INCREASED BY TEN PERCENT DURING 1980s

Plant growth in Earth's northern regions increased by ten percent from 1981 to 1991, and by the end of this period annual growth began about eight days earlier, according to new NASA-funded research published in today's issue of the scientific journal "Nature."

These findings imply that vegetation in Earth's northern high latitudes (between 45-70 degrees North) is actively responding to previously reported measurements of increasing atmospheric carbon dioxide levels and warmer-than-average surface temperatures in the north during the past three decades.

"Our results demonstrate that Earth's biosphere -- its plants, animals and life -- is not a passive participant in our planet's environment," said Dr. Ranga Myneni of Boston University, a co-author of the study. "The warming during springtime is particularly significant because of the related decline in snow cover. As a result, spring greening is happening significantly earlier."

While the global effects of such greening may be small, "regionally, they could be highly significant for interests such as agriculture and land-use planning," said co-author Dr. Ghassem Asrar of NASA Headquarters, Washington, DC. "In addition, our initial analysis of data from 1992 - 1994 indicates that the trends are continuing."

The published research was conducted by scientists from Boston University, Boston, the Scripps Institution of Oceanography, La Jolla, CA; NASA Goddard Space Flight Center, Greenbelt, MD; NASA Headquarters, Washington, DC; and the University of

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Montana in Missoula, using data from Advanced Very High Resolution Radiometer instruments aboard the NOAA-7, NOAA-9 and NOAA-11 satellites. The Sahara Desert in Africa was used as a common reference point to adjust the measurements across the different sensors.

Vegetation in the latitudes north of 45 degrees covers about 13.6 million square miles (35.3 million square kilometers), or approximately 35 percent of global vegetation during August, the greenest month of the year. In general, the greatest increases in vegetation took place inland from oceans. Bands of increased growth were measured from Spain in a northeasterly direction across central Europe and southern Russia, and in North America from Alaska in a southeasterly direction to the U.S. Great Lakes and northeast again to Labrador in Canada. Outside of this band, little change was seen in the continental United States.

Living plants absorb carbon dioxide from the atmosphere in the process known as photosynthesis. "Any predictions of future concentrations of atmospheric carbon dioxide must now include the response of global vegetation," said Myneni. "While plant growth tends to cool the immediate surroundings, we do not yet know what this finding means in terms of climate change."

"These findings add support to the emerging idea that regional changes in Earth's land, air and oceans are likely more extreme than those considered in an exclusively global context," Asrar added.

The full scientific paper and related color graphics are available on the Internet at the following URL:

http://www.forestry.umt.edu/ntsg/nature/

The research is funded by NASA's Office of Mission to Planet Earth, a long-term, internationally coordinated research effort to study the Earth as a global environmental system.

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News Release

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

Sonja Alexander Maclin
Headquarters, Washington, DC
(Phone: 202/358-1761)

For Release

April 18, 1997

RELEASE: 97-72

FOUR FIRMS RECEIVE NASA'S GEORGE M. LOW AWARD

NASA Administrator Daniel S. Goldin presented four companies the 1997 George M. Low Award at the Twelfth Annual NASA Continual Improvement and Reinvention Conference on Quality Management today in Alexandria, VA. The award is NASA's highest quality and excellence award for contractors and subcontractors.

The recipients are:

In the large business, product category:
Rocketdyne Division, North American Boeing, Inc., Canoga Park, CA
In the small business, product category:
Dynamic Engineering, Inc., Newport News, VA
In the small business, service category:
Hummer Associates, Cleveland, OH
Scientific & Commercial Systems Corporation, Moffett Field, CA

"These organizations have demonstrated an exceptional level of quality and technical performance, benefiting both NASA and the Nation," said Fred Gregory, NASA Associate Administrator for Safety and Mission Assurance and member of the George M. Low Award panel of judges.

Rocketdyne, builder of the Space Shuttle main engines, has made exceptional organizational quality changes and has demonstrated measurable improvements, including reduced Space Shuttle main engine-related delays. Dynamic Engineering, developer and manufacturer of one-of-a-kind products, has exemplified strong, entrepreneurial leadership which has improved customer satisfaction at NASA's Langley Research Center and Marshall Space Flight Center.

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Hummer Associates, a small, women-owned business which provides health care to NASA's Lewis Research Center, has exceeded all scheduled requirements for the past 10 years and has been below contract costs for the past five years. Scientific and Commercial Systems Corporation is a small, minority-owned business that has provided excellent support to NASA's Ames Research Center in technical, administrative and logistic areas during a 50% reduction in contract price.

The conference featured NASA Administrator Goldin reporting on NASA's highest priorities, as well as keynote presentations by George David, President, CEO, and Chairman of the Board-designate of United Technologies Corporation; Paul B. Smith, the new President and CEO of United Space Alliance; and Gordon M. Bethune, Chairman of the Board and President of Continental Airlines, Inc.

In addition to celebrating Low Award winners, the conference serves as a forum to share best practices and lessons learned from quality management initiatives.

-end-

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National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

Don Nolan-Proxmire
Headquarters, Washington, DC
(Phone: 202/358-1983)

John Bluck
Ames Research Center, Mountain View, CA
(Phone: 415/604-5026)

For Release
April 18, 1997

RELEASE: 97-73

GIRLS "CHAT" ON INTERNET WITH NOTABLE WOMEN ON DAUGHTERS' DAY

Notable women will participate in live "Internet chats" with youngsters worldwide on April 24, "Take Our Daughters to Work Day." Representing diverse pursuits, the women mentors range from Olympic marathoner Nancy Ditz to Cable News Network anchor Judy Woodruff. The Virtual Daughters' Day event is sponsored by NASA's Learning Technology Project (LTP), based at NASA's Ames Research Center, Mountain View, CA.

During the "chats," youngsters will use computers to converse with the women mentors by typing questions and reading responses and dialogue via the World Wide Web.

"I am excited to have this chance to 'talk' to girls and young women across the country about topics that interest them," said Woodruff. Sessions will take place on Thursday, April 24, from 9 a.m. to 7 p.m. EDT. Each mentor will be online for 45 minutes. There will be 15-minute breaks between sessions. The Internet URL is:

http://quest.arc.nasa.gov/women/intro.html

Participation is easy. "If you have a personal computer with Internet access and web browser software, you can log onto the NASA site to see a schedule, background information about the women, chat instructions and pre-registration materials. Then, on April 24, go to the chat room, and follow directions," said executive producer, Tish Krieg, who works at Ames.

"We are limited by the capacity of mentors to answer a large volume of questions. Therefore, first-come, first-serve pre-registration via the Internet is required in order for youngsters to be able to chat," she explained. "All others can observe the conversations which will be very informative and exciting experiences in themselves," she said.

Other women to take part in the April 24 program include: First Chair Piccolo and Flute, Laurie Sokoloff, of the Baltimore Symphony Orchestra; Dr. Susan Love, Director, Santa Barbara Breast Cancer Institute and author of "Dr. Susan Love's Breast Book;" Founding

-more-

and Managing Director Sue Clymer of NichibBei Bio; Desiree Cherry, partner in civil law practice; Director of Mars Exploration, Donna Shirley, of NASA's Jet Propulsion Laboratory; Chief Executive Officer Carol Bartz of Autodesk, Inc.; and retired astronaut Mae Jemison, M.D.

"Last year we had a similar program, but we featured only NASA women," said Krieg. "This year we want to focus on a broad spectrum of careers. Many girls want to talk with successful women not only about academic and technical subjects, but also about personal concerns such as child care, marital issues and homemaking tasks," she said. "Many girls will ask questions like 'How do you balance personal and professional lives?'" Krieg predicted.

The Daughters' Day virtual event is being done in conjunction with "The Women of NASA" project. That project includes weekly chats with highly accomplished NASA women, according to Ames' LTP manager, Karen Traicoff.

"The overall mission of LTP projects is to share NASA with classrooms," Krieg added. "We sponsor on-line, interactive Internet activities that connect students with NASA people and their work. Research has shown that students learn better by real-life experiences. If we can give children opportunities to interact with professionals about their jobs, then these youngsters will gain far more than if they were only to read about these subjects," she said.

LTP is managed by NASA's High Performance Computing and Communications Program (HPCC) at NASA Headquarters, Washington, DC.

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(202) 358-1600

For Release

Debra Rahn
Headquarters, Washington, DC
(Phone: 202/358-1639)

April 18, 1997

Eileen Hawley
Johnson Space Center, Houston, TX
(Phone: 281/483-5111)

RELEASE: 97-74

COMMANDER, PILOT, FLIGHT ENGINEER ROUND OUT STS-90 CREW

Richard A. Searfoss (Lt. Colonel, USAF) will command a 16-day mission to study the ability of humans to operate in a microgravity environment for an extended period of time. Joining Searfoss on Columbia's flight deck will be Pilot Scott D. Altman (Lt. Commander, USN) and Mission Specialist Kathryn "Kay" Hire. STS-90 is scheduled for a March 1998 launch.

They will join Richard M. Linnehan and Dafydd "Dave" Rhys Williams, MD, (Canadian Space Agency) who were named in August 1996 to support the STS-90 Neurolab mission and two Payload Specialists who will be selected closer to flight.

Searfoss, 40, has flown twice on the Shuttle, as pilot on STS-58 on Shuttle Columbia in 1993 and most recently as pilot on Atlantis' third docking with Russia's Mir space station in March 1996. STS-90 will be Searfoss' first flight as a Shuttle Commander.

Altman and Hire, both 37, are members of the 1995 Astronaut Class, making their first trip to space after completing more than a year of training to prepare for assignment to Shuttle flights and supporting technical assignments within the Astronaut Office.

Four candidates currently are training for selection as prime and backup payload specialist positions on STS-90. Dr. Jay C. Buckey, Dr. Alexander W. Dunlap, Dr. Chiaki Mukai and Dr. James A. Pawelczyk were named in April 1996. Two will fly on the mission, with the remaining two serving as backup or alternate payload specialists ready to fly on the mission if necessary.

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Investigations during the Neurolab mission will focus on the effects of microgravity on the nervous system. Specifically, experiments will study the adaptation of the vestibular system and space adaptation syndrome, the adaptation of the central nervous system and the pathways which control the ability to sense location in the absence of gravity, and the effect of microgravity on a developing nervous system.

For complete biographical information on the STS-90 crew, or any astronaut, see the NASA Internet biography home page at URL:

http://www.jsc.nasa.gov/Bios/

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For Release
April 21, 1997

Deanna Corridon
Headquarters, Washington, DC
(Phone: 202/358-1733)

VIDEO ADVISORY: V97-35

GEARING UP FOR NANOGEARS

Featured on NASA Television Monday, researchers at NASA's Ames Research Center (ARC), Mountain View, CA, have used a supercomputer to simulate molecular-sized gears which could be used in future products. These products, made up of thousands of micro-machines, could have the ability to self-repair and adapt to their environments.

ITEM #1a: NANOGEARS ANIMATION

Animation depicting how molecular gears might work. *For more information contact Don Nolan-Proxmire at (202) 358-1983 or John Bluck at (415) 604-5024.*

ITEM #1b: INTERVIEW - AL GLOBUS, RESEARCH SCIENTIST, AMES RESEARCH CENTER

Discusses nanogears.

Video news file today at noon, 3, 6, 9 p.m. and midnight EDT.

NTV is available on GE-2, transponder 9C at 85 degrees West longitude, vertical polarization, with a frequency of 3880 MHz, and audio of 6.8 MHz.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Don Nolan-Proxmire
Headquarters, Washington, DC
(Phone: 202/358-1983)

April 21, 1997

John Bluck
Ames Research Center, Mountain View, CA
(Phone: 415/604-5026)

RELEASE: 97-75

NASA EXPLAINS HOW MOLECULAR-SIZED GEARS MIGHT WORK

A technical paper sponsored by NASA and recently accepted by the journal "Nanotechnology" explains how molecular-sized gears might work.

"Thanks to simulation of molecular-sized gears by a NASA supercomputer, hope is growing that products made of thousands of tiny machines that could self-repair or adapt to the environment can ultimately be constructed," said Al Globus, a co-author of the paper.

Authors are Jie Han, Al Globus, Richard Jaffe and Glenn Deardorff of NASA's Ames Research Center, Mountain View, CA.

Researchers have simulated attaching benzyne molecules to the outside of a nanotube to form gear teeth, explained Globus. Nanotubes are molecular-sized pipes made of carbon atoms. "You also need a cooling system for gears. We used a supercomputer to simulate successful cooling of molecular-sized gears with helium and neon gases," he explained.

To "drive" the gears, the computer simulated a laser that served as a motor. "The laser creates an electric field around the nanotube. We put a positively charged atom on one side of the nanotube, and a negatively charged atom on the other side. The electric field drags the nanotube around like a shaft turning," he said.

"These gears would rotate best at about 100 billion turns per second or six trillion rotations per minute (rpm)," he added. The gears that Globus and others have simulated with computers would be about a nanometer across. A nanometer is one-billionth of a meter.

One practical use of nanotechnology would be to build a "matter compiler," said Creon Levit, a Globus colleague at Ames. "We would give this machine, made of nano parts, some raw materials, like natural gas, for example. A computer program would specify an arrangement of atoms, and the matter compiler would arrange the atoms from the raw materials to make a macro-scale machine or parts," Levit added.

-more-

"A matter compiler is not just science fiction. In the biotechnology industry, there are already 'peptide synthesizers' in use. You give them a sequence of amino acids you want produced, and the machine will create those peptides. But you can't make rockets out of peptides," he said. A peptide is a sequence of amino acids.

"A step along the way to make an aerospace matter compiler is an even smaller hypothetical machine, the 'assembler/replicator,'" said Globus. "The replicator can make a copy of itself, just as a living cell can duplicate itself.

"We would like to write computer programs that would enable assembler/replicators to make aerospace materials, parts and machines in atomic detail," he said. "Such materials should have tremendous strength and thermal properties." Further information on these materials can be obtained on the researchers' Internet page at URL:

http://www.nas.nasa.gov/nanotechnology.

An image of the nanogear from a computer simulation is available at the following URL:

http://ccf.arc.nasa.gov/dx/basket/storiesetc/Nanopix.html

A long range goal, according to Globus, is to make materials that have radically superior strength-to-weight ratio. Diamond, for example, has 69 times the strength-to-weight ratio of titanium. A second goal is to make "active" or "smart" materials.

"There is absolutely no question that active materials can be made," Globus explained. "Look at your skin. It repairs itself. It sweats to cool itself. It stretches as it grows. It's an active material," he said.

Globus strongly emphasized that making real nanomachines may be decades away, but he said that computer simulations suggest the tiny machines are possible after engineers learn to build nanoparts and to assemble nanomachines.

The nanogear and other related Ames research is a collaboration between the Ames Numerical Aerospace Simulation Systems Division and the Ames Computational Chemistry Branch.

-end-

Note to Editors: A black & white image of the molecular-sized gears is available by calling the Broadcast & Imaging Branch at 202/358-1900. The photo number is 97-H-220.

News Release

National Aeronautics and
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Washington, DC 20546
(202) 358-1600

For Release

Debra Rahn
Headquarters, Washington, DC
(Phone: 202/358-1639)

April 21, 1997

Eileen Hawley
Johnson Space Center, Houston, TX
(Phone: 281/483-5111)

RELEASE: 97-76

APT RETIRES FROM ASTRONAUT CORPS

Four-time Shuttle astronaut Jay Apt will leave NASA in late May to become director of the Carnegie Museum of Natural History in Pittsburgh, PA.

"The astronaut office will miss Jay's dedication and spirit," said David C. Leestma, director of Flight Crew Operations. "I am sure he will use this new position to continue his efforts to educate and inspire young people to excel."

Apt first flew on STS-37 on Atlantis in 1991, conducting two spacewalks, including one unscheduled EVA to deploy manually the antenna on the Gamma Ray Observatory spacecraft. He flew twice on Endeavour, during STS-47 in 1992 for the Spacelab-J mission, and again for STS-59, the first flight of the Space Radar Laboratory in 1994. Most recently, Apt flew aboard Atlantis on STS-79, the fourth Shuttle-Mir docking mission, in 1996.

"Every minute that I've been a part of the space exploration program has been fascinating" said Apt. "I am delighted to have had the opportunity to fly around our planet hundreds of times, and now it is time to give something back to the people who sent me there. I am thrilled by the chance to return to Pittsburgh and lead one of the best museums in America into the next century. Providing an exciting environment for both families and scientists to learn about this planet is going to be the most challenging and interesting job I can imagine doing."

For complete biographical information on Apt and other astronauts, see the NASA Internet astronaut biography home page at address:

http://www.jsc.nasa.gov/Bios/

-end-

Video Advisory

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

Deanna Corridon
Headquarters, Washington, DC
(Phone: 202/358-1733)

For Release
April 22, 1997

VIDEO ADVISORY: V97-36

READY TO GOES

Animation supporting the upcoming GOES-K weather satellite launch, scheduled for April 24, will be featured on NASA Television Tuesday. GOES-K will be "parked" in orbit to take over the other two GOES satellites when needed. Thus, continuous service is assured.

ITEM #1a: LAUNCH AND PARK - Animation
Animation shows how GOES-K will be put in standby mode.
ITEM #1b: COVERAGE - Animation
Animation shows how the U.S. will be seen by the GOES satellite system.
ITEM #1c: NEW WEATHER TOOLS
NASA scientists are developing tools and technologies to improve forecasting.
ITEM #1d: WEATHER B-ROLL
ITEM #1e: INTERVIEW - DR. ELBERT W. "JOE" FRIDAY
Dr. Friday, Director of the National Weather Service, discusses advantages of the GOES system.
ITEM #1f: INTERVIEW - DR. FRITZ HASLER
Chief Scientist for NASA Goddard Space Flight Center's Laboratory for Atmospheres, Dr. Hasler discusses new weather tools.

ITEM #2a: REPLAY - CASSINI HEADS FOR KSC
ITEM #2b: REPLAY - CASSINI ARRIVES AT KSC
ITEM #3: REPLAY - NANOGEARS

Video news file today at noon, 3, 6, 9 p.m. and midnight EDT.

NTV is available on GE-2, transponder 9C at 85 degrees West longitude, vertical polarization, with a frequency of 3880 MHz, and audio of 6.8 MHz.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Michael Braukus
Headquarters, Washington, DC
(Phone: 202/358-1979)

April 22, 1997

RELEASE: 97-77

NASA CONCURS WITH INDEPENDENT REVIEW OF BION 11 MISSION

NASA is suspending its participation in primate research on the Bion 12 mission, part of an international project to study the physiological effects of low gravity and space radiation. NASA's decision is based on the recommendations of an independent review board requested by the Agency to look into the post-flight death of a rhesus monkey following the successful flight and landing of the Bion 11 satellite.

The panel found that there was an unexpected mortality risk associated with anesthesia for surgical procedures (biopsy of bone and muscle) on the day following return from space. NASA has determined that this risk is unacceptable and is therefore discontinuing its participation in the primate experiments on Bion 12.

The independent review was led by Dr. Ronald Merrell, chairman, Department of Surgery, Yale University, New Haven, CT. Dr. Merrell closely consulted with the Russian Bioethics Commission of the Russian Academy of Sciences, which conducted the Russian inquiry.

Based on the difficulty encountered with post-flight anesthesia on the Bion 11 mission, the research protocols originally developed for the Bion 12 mission cannot be conducted without an unacceptable risk to the primates. NASA therefore plans to:

- incorporate lessons learned from this mission into ongoing scientific research, reviews and medical considerations for space flight;

- in concert with the biomedical community, conduct research with the appropriate models to investigate medical care in relation to space physiology;

- work with the biomedical research community to develop new technologies for collecting critical data needed to continue this important research.

-more-

The Bion program is a cooperative space venture among the U.S., Russian and French space agencies for conducting biomedical research using Russian-owned rhesus monkeys. The 14-day Bion 11 mission, carrying two rhesus monkeys as well as other life science and microgravity experiments, began on Dec. 24, 1996, with its launch from Russia's Plesetsk launch site. The flight was successfully completed when the spacecraft landed in Kazakhstan on Jan. 7, 1997.

Experiments flown on the Bion missions encompass a broad range of important investigations that expand our understanding of a variety of fundamental and applied life sciences questions.

In space, as on the ground, biomedical research on animals plays a vital role in expanding NASA's capacity to understand and treat medical problems. NASA is deeply concerned with the welfare of its animals and is fully committed to conducting its animal research programs in conformance with the highest ethical standards. The Bion experiments were thoroughly reviewed four times by NASA and outside panels to ensure that they met ethical standards, and that they pursued worthwhile and important scientific objectives that could not be achieved without the use of animals.

-end-

News Release

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release

Douglas Isbell
Headquarters, Washington, DC
(Phone: 202/358-1753)

April 23, 1997

RELEASE: 97-78

FIVE DISCOVERY MISSION PROPOSALS SELECTED FOR FEASIBILITY STUDIES

In the first step of a two-step process, NASA has selected five proposals for detailed study as candidates for the next missions in the Agency's Discovery Program of lower-cost, highly focused scientific spacecraft.

The proposals selected for further study would send spacecraft to study Mercury, the atmosphere of Venus, the moons of Mars, comets and the solar wind.

Following the feasibility studies, which are due for submission by August 15, NASA intends to select one or two of the investigations in October for full development as the next Discovery Program flights.

"This excellent and innovative set of proposals really demonstrates the maturing nature of the Discovery Program," said Dr. Wesley Huntress, NASA Associate Administrator for Space Science. "The selected concepts include a mission to a planet, Mercury, that we have not visited with a spacecraft in more than two decades, interesting complements to our currently planned cometary and Mars robotic missions, and the first attempt to gather a sample of particles from the Sun and bring them back to Earth."

The five selected proposals were judged to have the best science value among 34 proposals submitted to NASA in December 1996 in response to the Discovery Announcement of Opportunity (AO) issued on Sept. 20, 1996. Each now will receive $350,000 to conduct a four-month implementation feasibility study focused on cost, management and technical plans, including small business involvement and educational outreach. As stated in the AO, the initial cost estimates will be allowed to grow by a maximum of 20 percent in the detailed final proposals.

-more-

The selected proposals are:

- Aladdin, a mission to gather samples of the small Martian moons Phobos and Deimos by firing four projectiles into the moons' surface and gathering the ejecta during slow flybys, and then return the samples to Earth for detailed study. Aladdin would be led by Dr. Carle Pieters of Brown University, Providence, RI, at a total cost to NASA, including launch vehicle and operations, of $244 million.
- The Comet Nucleus Tour (CONTOUR), a mission to take images and comparative spectral maps of at least three comet nuclei and analyze the dust flowing from them. CONTOUR would be led by Dr. Joseph Veverka of Cornell University, Ithaca, NY, at a total cost of $135 million.
- Genesis, a mission to collect a sample of the solar wind and return it to Earth for detailed analysis. One of the finalists in the fourth round of Discovery program selections under the name Seuss-Urey, Genesis would be led by Dr. Donald Burnett from the California Institute of Technology, Pasadena, at a total cost of $218 million.
- The Mercury Surface, Space Environment, Geochemistry and Ranging mission, or Messenger, an orbiter spacecraft carrying seven instruments to image and study the closest planet to the Sun. Messenger would be led by Dr. Sean Solomon of the Carnegie Institution, Washington, DC, at a total cost of $257 million.
- The Venus Environmental Satellite (VESAT), an orbiter spacecraft to study the atmospheric chemistry and meteorology of Earth's cloud-covered neighbor using an imager, near-infrared spectrograph, a temperature mapper and an X-band radar. VESAT would be led by Dr. Kevin Baines of NASA's Jet Propulsion Laboratory, Pasadena, CA, at a total cost of $173 million.

The investigations proposed in response to this announcement (AO-96-OSS-02) were required to respond to the goals and objectives of the Office of Space Science's Solar System Exploration theme or the search for extrasolar planetary systems element of the Astronomical Search for Origins and Planetary Systems theme. The spacecraft must be ready for launch no later than Sept. 30, 2002, and meet the Discovery Program's development cost (launch plus 30 days) cap of $183 million in Fiscal 1997 dollars over 36 months.

The concepts under study will follow four previously selected NASA Discovery missions. The Near Earth Asteroid Rendezvous (NEAR) spacecraft was launched in Feb. 1996 on its way to orbit the asteroid Eros in 1999. The Mars Pathfinder lander, carrying a small robotic rover named Sojourner, is due to land on the surface of Mars on July 4. The Lunar Prospector orbiter mission to map the Moon's composition and gravity field, scheduled for launch in September, and the Stardust mission to gather dust from Comet Wild-2 in 2004, currently are under development.

-end-

News Release

National Aeronautics and
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Washington, DC 20546
(202) 358-1600

For Release
April 24, 1997

Debra Rahn
Headquarters, Washington, D.C.
(Phone: 202/358-1639)

Rob Navias / Ed Campion
Johnson Space Center, Houston, TX
(Phone: 281/483-5111)

NOTE TO EDITORS: N97-27

BRIEFINGS SET FOR NEXT SHUTTLE-MIR DOCKING MISSION

A series of briefings on the next flight of the Shuttle Atlantis to link up to the Russian space station Mir will be held at the Johnson Space Center (JSC), Houston, TX, on Friday, May 2. The briefings will be broadcast live on NASA Television.

The fourth mission of 1997, STS-84 is targeted for launch around May 15 to carry seven astronauts into orbit, including Mike Foale, who will become the fifth U.S. astronaut to conduct research on Mir. Foale will replace Jerry Linenger, who arrived on the Mir in January as part of the STS-81 crew. Linenger will return home aboard Atlantis.

The briefings will begin on May 2 at 9 a.m. EDT (all times listed are EDT) with an overview of the Shuttle-Mir Phase One Program, followed at 10:30 a.m. with the Mission Overview briefing, conducted by STS-84 Lead Flight Director Phil Engelauf. The NASA TV Video File will air at noon. The briefings will resume at 1 p.m. with the SPACEHAB briefing. The briefings will wrap up with the STS-84 Crew News Conference at 2 p.m.

Individual round-robin interviews with the STS-84 astronauts will be held after the crew news conference for reporters attending the briefing at JSC and for those who make special arrangements in advance to conduct the interviews by phone. NOTE: Reporters interested in round-robin interviews with the STS-84 astronauts should fax a letter of interest to Steve Nesbitt in JSC Public Affairs by close of business on April 30. The fax number for the JSC Public Affairs office is 281/483-2000. The round-robin interviews will not be seen on NASA TV.

NASA Television is available through the GE2 satellite which is located on Transponder 9C, at 85 degrees West longitude, frequency 3880.0 MHz, audio 6.8 MHz.

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STS-84 PRE-FLIGHT BRIEFINGS

9 a.m.	Phase One Overview (JSC) Frank Culbertson, Phase One Program Director Dr. John Charles, NASA-Mir Mission Scientist
10:30 a.m.	Mission Overview (JSC) Phil Engelauf, STS-84 Lead Flight Director
noon	NASA Television Video File (NASA HQ)
1:00 p.m.	SPACEHAB Overview (JSC) Mike Bain, Shuttle-Mir Program Manager, SPACEHAB
2:00 p.m.	STS-84 Crew News Conference (JSC) Charles J. Precourt (CDR) Eileen M. Collins, Pilot (PLT) Jean-François Clervoy, Mission Specialist 1 (MS 1) Carlos I. Noriega, Mission Specialist 2 (MS 2) Edward Tsang Lu, Mission Specialist 3 (MS 3) Elena V. Kondakova, Mission Specialist 4 (MS 4) C. Michael Foale, Mission Specialist 5 (MS 5-up)

(all times are EDT)

-end-

News Release

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release

Jim Cast
Headquarters, Washington, DC
(Phone: 202/358-1779)

April 25, 1997

RELEASE: 97-79

NASA SELECTS PHASE II SMALL BUSINESS PROJECTS

NASA has selected 14 additional research proposals for negotiation of Phase II contract awards for NASA's Small Business Innovation Research (SBIR) Program. The selected projects, which have a total value of approximately $8.4 million, will be conducted by 13 small, high-technology firms located in nine states. These additional selections are made possible by a strategic change in the FY1997 SBIR program funding plan.

SBIR goals are to stimulate technological innovation, increase the use of small business (including women-owned and disadvantaged firms) in meeting federal research and development needs, and increase private sector commercialization of results of federally funded research.

A total of 277 proposals were submitted by SBIR contractors completing Phase I projects that were initiated in 1995, and 170 were previously selected. These additional projects have all met SBIR Phase I objectives and been determined as feasible research innovations for meeting Agency needs. Selections were taken from the original "Recommendation list."

Phase II continues development of the most promising Phase I projects. Selection criteria include technical merit and innovation, Phase I results, value to NASA, commercial potential, and company capabilities. Funding for Phase II contracts may be up to $600,000 for a two-year performance period.

The NASA SBIR Program Management Office is located at the Goddard Space Flight Center, Greenbelt, MD, with executive oversight by NASA's Office of Aeronautics, NASA Headquarters, Washington, DC. Individual SBIR projects are managed by the NASA field centers and the Jet Propulsion Laboratory, Pasadena, CA.

-end-

EDITOR'S NOTE: Attached is a breakout of awards by NASA Center and State. A printed listing of companies selected for the program is available in the NASA Headquarters Newsroom (Phone: 202/358-1600) and can also be accessed on the internet at URL: http://sbir.hq.nasa.gov/SBIR.html

NASA PHASE II ADDITIONAL SELECTION DISTRIBUTIONS
April 25, 1997

STATE	SELECTIONS	FIRMS	STATE	SELECTIONS	FIRMS
California	4	4	New York	1	1
Connecticut	1	1	Texas	1	1
Florida	2	2	Virginia	1	1
Iowa	1	1	Wisconsin	1	1
New Hampshire	2	1			

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Dryden Flight Research Center Moffett Field, CA	1	1
Goddard Space Flight Center Greenbelt, MD	1	1
Jet Propulsion Laboratory Pasadena, CA	2	2
Johnson Space Center Houston, TX	2	2
Kennedy Space Center Kennedy Space Center, FL	1	1
Langley Research Center Hampton, VA	1	1
Lewis Research Center Cleveland, OH	1	1
Marshall Space Flight Center Marshall Space Flight Ctr, AL	2	2
NASA Headquarters Washington, DC	1	1
Stennis Space Center Stennis Space Center, MS	1	1

News Release

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For Release

Debra Rahn
Headquarters, Washington, DC
(Phone: 202/358-1639)

April 25, 1997

Rob Navias / Ed Campion
Johnson Space Center, Houston, TX
(Phone: 281/483-5111)

RELEASE: 97-80

U.S. ASTRONAUT READY FOR MILESTONE SPACEWALK

U.S. astronaut Jerry Linenger, more than 100 days into his four-month research mission on the Space Station Mir, is scheduled to conduct his first spacewalk next Tuesday, April 29, to place experiments on two of the station's modules and to retrieve two others deployed outside the Mir last year. He will be joined by Mir 23 Commander Vasily Tsibliev.

The spacewalk, which is supposed to last about six hours, marks the first time a U.S. astronaut will conduct a spacewalk wearing a Russian spacesuit. Russian cosmonaut Vladimir Titov is scheduled to conduct a spacewalk wearing a U.S. spacesuit during Atlantis' docking mission to the Mir in September.

Astronauts Linda Godwin and Rich Clifford conducted a spacewalk outside the Shuttle Atlantis last year to place suitcase-sized sensors and materials designed to catch debris on the Mir's docking module to determine how often debris hits the surface of the Mir and to assess outside environmental factors.

During his spacewalk, Linenger will deploy an experiment to collect data on how the space environment affects the Mir's outersurface (Optical Properties Monitor Experiment). He will also retrieve the Partial Impact Experiment and the Mir Sample Experiment from the Kvant-2 science module; both experiments were deployed by Russian cosmonauts during a spacewalk last year and are designed to monitor the outside environment of the Mir.

Linenger and Tsibliev also will place a radiation detection device called the Benton radiation dosimeter on the Kvant-2 near the end of their spacewalk and evaluate a safety tether which may be used by both American and Russian spacewalkers in the assembly of the International Space Station.

-more-

Tsibliev conducted five spacewalks during his previous flight on the Mir in 1993. This will be Linenger's first spacewalk. Tsibliev plans to conduct two more spacewalks with Flight Engineer Alexander Lazutkin, in June, about a month after U.S. astronaut Mike Foale has replaced Linenger on board the Russian outpost.

The spacewalk is expected to be seen on NASA Television from 6 a.m. to 6:30 a.m. EDT and from 7:30 a.m. to 8:30 a.m. EDT. Highlights will be replayed on NASA TV's Video File at noon EDT.

NASA Television is available through the GE2 satellite, located on Transponder 9C, at 85 degrees West longitude, frequency 3880.0 MHz, audio 6.8 MHz.

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News Release

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release

Debra Rahn
Headquarters, Washington, DC
(Phone: 202/358-1639)

April 25, 1997

Kyle Herring
Johnson Space Center, Houston, TX
(Phone: 281/483-5111)

RELEASE: 97-81

MICROGRAVITY SCIENCE LABORATORY MISSION SET FOR JULY; REMAINING 1997 SHUTTLE MANIFEST ADJUSTED SLIGHTLY

Columbia's Microgravity Science Laboratory (MSL) mission will fly again in early July to complete the mission cut short earlier this month because of a fuel cell problem. The remaining Space Shuttle flights in 1997 have been adjusted to accommodate Columbia's mission, which will fly as STS-94. Air Force Lt. Col. Jim Halsell and the rest of the STS-83 crew will fly this mission and will conduct proficiency training until the flight.

Space Shuttle Program managers today formally baselined the STS-94 mission to follow Atlantis' sixth docking with the Russian space station Mir next month. Astronaut Jerry Linenger will return home on STS-84 following a four-month stay on Mir, and Mike Foale will replace him as a station crew member. Managers will formally select the launch date following the Flight Readiness Review on April 30.

"While shortening STS-83 was disappointing, we now are in a position to do everything possible to complete the MSL mission with minimal impact to downstream flights," said Space Shuttle Program Manager Tommy Holloway. "Also, it provides us with a unique opportunity to demonstrate our ability to respond to challenges such as this one."

Reflying Columbia in July dictated that downstream flights for the remainder of the year change slightly. Following STS-94, Discovery will fly in early- to mid-August on the STS-85 mission to deploy and retrieve a science satellite to study Earth's atmosphere. The flight also will demonstrate the use and operational capability of a robot arm that will be deployed outside the Japanese Experiment Module of the International Space Station.

The seventh Shuttle-Mir docking mission on Atlantis is targeted for mid- to late-September. STS-86 will include the return of Foale from Mir and delivery of his replacement, astronaut Wendy Lawrence.

-more-

The eighth and final mission scheduled in 1997 will be the STS-87 flight of Columbia slated for mid- to late-November. The 16-day mission includes the conduct of science experiments associated with the fourth flight of the U.S. Microgravity Payload and the deployment and retrieval of a science satellite.

-end-

News Release

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release

Debra Rahn
Headquarters, Washington, DC
(Phone: 202/358-1778)

April 28, 1997

Ed Campion
Johnson Space Center, Houston, TX
(Phone: 281/483-5111)

RELEASE: N97-29

NEW PRESS ACCREDITATION AND ACCESS PROCEDURES TO BEGIN AT JOHNSON SPACE CENTER STARTING MAY 1

Beginning Thursday, May 1, the Johnson Space Center (JSC), Houston, TX, will modify the process news media use to obtain on-site press accreditation. The changes are being made to simplify the accreditation process at JSC.

The process for obtaining and using mission badges issued for a specific Shuttle mission will remain unchanged. Shuttle mission badges still will be issued by both Kennedy Space Center, FL, and JSC and will continue to allow access to all approved areas at JSC from launch day to landing day.

For news media wishing to come to JSC during non-mission periods, JSC now will use a temporary visitor badge, issued for a specific visit to the Center. The visitor badge will be good either for a single day visit or multiple days depending on the nature of the visit. No previously issued news media badges (e.g. a one-year picture type, earlier Shuttle missions, etc.) will be accepted as of May 1. News media will need to follow the new temporary visitor badge procedures for access to JSC beginning May 1.

News media wanting more information on the new badging procedure should contact the JSC newsroom at 281/483-5111 during normal business hours, 8 a.m. - 5 p.m. CDT.

- end -

Video Advisory

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release
April 28, 1997

Deanna Corridon
Headquarters, Washington, DC
(Phone: 202/358-1733)

VIDEO ADVISORY: V97-37

OBSERVATORY DISCOVERS AN ANTIMATTER CLOUD;
NASA GIVES THE COMPTON GAMMA RAY OBSERVATORY A BOOST

On NASA Television Monday, scientists using data obtained by instruments on NASA's Compton Gamma Ray Observatory discover a unexpected cloud of antimatter near the galactic center. NASA is giving a reboost to GRO, extending its life span by 10 years. NTV also will replay B-roll of astronaut Jerry Linenger on the Mir space station preparing for his historic spacewalk on April 29. Linenger will be the first U.S. astronaut to conduct a spacewalk from the Mir with Russian cosmonauts.

ITEM #1a: REPLAY - LINENGER SPACEWALK PREPARATION
B-roll of Astronaut Jerry Linenger training for his historic spacewalk.

ITEM #2a: ANTIMATTER CLOUD IN THE MILKY WAY
Animation showing location of antimatter cloud observed by GRO.

ITEM #2b: ANTIMATTER ANNIHILATION ANIMATION
Animation demonstrates the intense amount of gamma ray radiation emitted when a positron and a electron collide.

ITEM #2c: ANTIMATTER SOURCES
Possible sources of the antimatter cloud above the center of the Milky Way Galaxy.

ITEM #2d: INTERVIEW - DR. JIM KURFESS, HEAD OF GAMMA RAY AND COSMIC RAY ASTROPHYSICS BRANCH, NAVAL RESEARCH LABORATORY (NRL)
Describes the new finding of antimatter above the center of the Milky Way and discusses how the GRO helped discover the cloud.

ITEM #2e: INTERVIEW - DR. CHARLES DERMER, ASTROPHYSICIST, GAMMA RAY & COSMIC RAY ASTROPHYSICS BRANCH, NRL
Discusses the theory that antimatter is made in black holes and suggests that the new discovery of antimatter may help scientists locate more black holes in the universe.

ITEM #3a: REBOOST ANIMATION
Animation depicting the reboost of the GRO.

ITEM #3b: GRO ANIMATION B-ROLL
Animation of GRO.

ITEM #3c: GRO B-ROLL
Deployment of GRO during the STS-37 Space Shuttle Mission.

ITEM #3d: INTERVIEW - BOB SODANO, GRO MISSION DIRECTOR FOR OPERATIONS
Discusses why the reboost is so important and also the goals of the reboost.

Video news file today at noon, 3, 6, 9 p.m. and midnight EDT.

NTV is available on GE-2, transponder 9C at 85 degrees West longitude, vertical polarization, with a frequency of 3880 MHz, and audio of 6.8 MHz.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

Michael Braukus
Headquarters, Washington, DC
(Phone: 202/358-1979)

For Release
April 28, 1997

RELEASE: 97-82

PAYLOAD SPECIALISTS SELECTED FOR FUTURE SHUTTLE MISSION

NASA today announced the selection of Dr. Jay C. Buckey and Dr. James A. Pawelczyk as the primary payload specialists for the 1998 Space Shuttle Neurolab mission.

NASA also named Dr. Alexander W. Dunlap, University of Tennessee College of Medicine, Memphis, and Dr. Chiaki Mukai, an astronaut with the National Space Development Agency of Japan, to serve as alternates. As an alternate, Dunlap and Mukai will undergo the same training as Buckey and Pawelczyk and will be ready to serve on the mission crew if necessary.

Neurolab, a 16-day mission dedicated to research on the nervous system and behavior, is scheduled for launch on the Space Shuttle Columbia in early 1998. The mission is a joint venture of six space agencies and seven U.S. research agencies. Investigator teams from nine countries will conduct 31 studies in the microgravity environment of space. The goals of Neurolab are to study basic research questions and to increase the understanding of the mechanisms responsible for neurological and behavioral changes in space.

Other agencies participating in this mission include six institutes of the National Institutes of Health, the National Science Foundation, and the Office of Naval Research, as well as the space agencies of Canada, France, Germany, and Japan, and the European Space Agency.

Dr. Buckey, 39, earned a doctor of medicine degree from Cornell University Medical College, Ithaca, NY. He is an associate professor of medicine at Dartmouth Medical School, Hanover, NH. Buckey was an alternate payload specialist for STS-58, the second Spacelab Life Sciences mission.

Dr. Pawelczyk, 35, received a doctor of philosophy degree in biology from the University of North Texas in Denton. He is an assistant professor of applied physiology at Penn State University, University Park, PA.

The other members of the STS-90 crew are:
Commander Richard A. Seafoss (Lt. Col., USAF),
Pilot Scott D. Altman (Lt. Cdr.,USN)
Mission Specialist Kathryn "Kay" Hire
Mission Specialist Richard M. Linnehan
Mission Specialist Dafydd "Dave" Rhys Williams, M.D., (Canadian Space Agency)

-end-

News Release

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release

April 28, 1997

Donald Savage
Headquarters, Washington, DC
(Phone: 202/358-1727)

Jim Sahli
Goddard Space Flight Center, Greenbelt, MD
(Phone: 301/286-0697)

Janice Schultz
Naval Research Laboratory, Washington, DC
(Phone: 202-767-2856)

RELEASE: 97-83

ANTIMATTER CLOUDS AND FOUNTAIN DISCOVERED IN THE MILKY WAY

Scientists using data from an instrument on NASA's Compton Gamma Ray Observatory (CGRO) have discovered two unexpected clouds of antimatter in the Milky Way Galaxy which scientists call "antimatter annihilation radiation."

Scientists from Northwestern University, Evanston, IL, the Naval Research Laboratory (NRL), Washington, DC, and other institutions used CGRO's Oriented Scintillation Spectrometer Experiment (OSSE) to make the discovery, which points to the existence of a hot fountain of gas filled with antimatter electrons rising from a region that surrounds the center of the Milky Way galaxy. The nature of the furious activity producing the hot antimatter-filled fountain is unclear, but could be related to massive star formation taking place near the large black hole at the center of the galaxy. Other possibilities include winds from giant stars or black hole antimatter factories.

The researchers used maps of gamma ray sources from CGRO which they expected to show a large cloud of antimatter near the galactic center and along the plane of the galaxy. The maps, surprisingly, also show a second cloud of antimatter well off the galactic plane. The second cloud may be caused by the explosions of young massive stars.

"The origin of this new and unexpected source of antimatter is a mystery," said William R. Purcell, research scientist and assistant professor of physics and astronomy at Northwestern University.

"The antimatter cloud could have been formed by multiple star bursts occurring in the central region of the galaxy, jets of material from a black hole near the galactic center, the merger of two neutron stars, or it could have been produced by an entirely different source," said James D. Kurfess, head of the Gamma and Cosmic Ray Astrophysics Branch at the Naval Research Laboratory.

-more-

The researchers presented their findings today at the fourth Compton Symposium in Williamsburg, VA. The results have been submitted for publication in the Astrophysical Journal. A second paper presented at the conference, titled "The Annihilation Fountain in the Galactic Center Region," examines theoretical models for one possible source of the antimatter -- star bursts in the central region.

The second paper is authored by Dr. Charles Dermer and Dr. Jeffrey Skibo of NRL. They note that the gamma-ray observations permit us to see clearly, for the first time, a new part of our galaxy made of a hot column of gas filled with antimatter electrons (also called positrons by scientists), and they argue that the antimatter electrons come from newly created elements produced by exploding stars formed near the center of our galaxy.

"It is like finding a new room in the house we have lived in since childhood," comments Dr. Dermer. "And the room is not empty -- it has some engine or boiler making hot gas filled with annihilating antimatter. No one is certain whether the antimatter comes from exploding stars, black holes or something entirely different, and that is what makes this discovery so exciting."

Evidence points to the existence of a black hole with the mass of a million Suns at the very center of our galaxy. Unlike in other galaxies which harbor huge black holes, very little light comes from this source. Huge dense clouds of gas also surround the galactic center. Prolific star formation, powerful stellar winds from massive stars, and supernovae are all found here. Another theory, based on observation of radio emissions showing some black holes produce X-rays and jets, is that such outflowing jets could be made of antimatter.

The Compton Gamma Ray Observatory, launched from the Space Shuttle in 1991, views the universe in a search for gamma rays and their source. Gamma rays are extremely energetic light photons produced by high-energy particles, by the decay of excited nuclei, and when matter and antimatter annihilate each other. Antimatter cannot be found in large quantities on Earth because it would instantly vaporize anything it came into contact with. All evidence points to the universe being composed almost entirely of normal matter, though opinions differ on this.

Using the OSSE experiment, the OSSE team found antimatter positrons to be annihilating with normal matter electrons at an astonishing rate. Scientists are speculating on the origin of this antimatter, with a "black-hole lobby" favoring antimatter production in the jets of black holes.

Other scientists favor freshly synthesized radioactive material in stellar explosions being ejected up above our galaxy in an annihilating fountain of gas. Drs. Dermer and Skibo favor the latter scenario, because exploding stars will eject large quantities of hot gas made up of normal matter. This hot gas provides a target with which the antimatter electrons can annihilate.

Related images may be obtained via the World Wide Web at:
http://www.astro.nwu.edu/aetro/purcell/511kev_presa_relesse

- end -

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Michael Braukus
Headquarters, Washington, DC
(Phone: 202/358-1979)

April 29, 1997

NOTE TO EDITORS: N97-30

NASA SPONSORS INTERNATIONAL SPACE STATION VIDEOCONFERENCE

An interactive videoconference on the status of the International Space Station project will give students and citizens a chance to question a panel of experts.

The live, interactive videoconference will air from 1-3 p.m. EDT May 1 to selected sites over the Public Broadcasting Service. News media interested in attending the event should call PBS Customer Service at 1-800/257-2578 for the nearest downlink site.

During the videoconference, participants will see how the space station is being built, tested, and prepared for launch and assembly in orbit. NASA engineers and astronauts will provide tours through the space station and its ground facilities.

This fourth annual videoconference program will be viewed by a national audience via satellite downlink to licensed sites at universities, businesses and schools. To find out more about the event, visit the Internet web site at:

http://centauri.larc.nasa.gov/issvc97/ssvideo.html

- end -

Video Advisory

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release
April 29, 1997

Deanna Corridon
Headquarters, Washington, DC
(Phone: 202/358-1733)

VIDEO ADVISORY: V97-38

NASA TV PLANS COVERAGE OF LINENGER'S HISTORIC SPACEWALK

On Tuesday NASA Television will have three videotape replays of U.S. astronaut Jerry Linenger's historic spacewalk outside the Russian Mir space station with Mir 23 Commander Vasily Tsibliev. Plans call for three feeds on NASA Television early tomorrow (all times are EDT):

- o **4:25 a.m.-4:55 a.m. (Videotape replay accompanied by commentary)**
- o **6:00 a.m.-6:30 a.m. (Videotape replay near the end of the spacewalk accompanied by commentary)**
- o **7:30 a.m.-8:30 a.m. (Videotape replay of highlights of the earlier spacewalk television downlinked to the Russian Mission Control Center accompanied by commentary)**

An edited package of the spacewalk highlights will be broadcast on the NASA TV Video File at 12:00 p.m. EDT and replayed throughout the afternoon on subsequent Video File feeds. Also replaying on NTV, scientists using data obtained by instruments on NASA's Compton Gamma Ray Observatory (GRO) discover an unexpected cloud of antimatter near the Milky Way galaxy; and NASA is giving a reboost to GRO, extending its life span by 10 years.

ITEM #1a: BEST OF THE MIR SPACEWALK
Highlights from Astronaut Jerry Linenger's historic spacewalk.

ITEM #2a: CATCHING A RIDE ON THE MIR
B-roll of the Optical Properties Monitor, which will be attached to the outside of Mir, and will orbit the Earth for a year helping scientists to develop future space hardware.

ITEM #2b: INTERVIEW - STEPHEN DAVIS PROJECT MANAGER
Discusses the Optical Properties Monitor.

ITEMS #3a-e: REPLAY - ANTIMATTER CLOUD IN THE MILKY WAY

ITEMS #4a-d: REPLAY - GIVING GRO A REBOOST

Video news file today at noon, 3, 6, 9 p.m. and midnight EDT.

NTV is available on GE-2, transponder 9C at 85 degrees West longitude, vertical polarization, with a frequency of 3880 MHz, and audio of 6.8 MHz.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Beth Schmid
Headquarters, Washington, DC
(Phone: 202/358-1760)

April 29, 1997

RELEASE: 97-84

STUDENT WINNERS TO BE HONORED IN WASHINGTON, DC

Twenty-seven students from public and private schools across the United States have won national recognition in NASA's 17th annual Space Science Student Involvement Program competition. The students will be honored along with their teachers at the National Space Science Symposium, May 3-7, at the Marriott Hotel at Metro Center, 775 12th St., NW, Washington, DC.

The competition, co-sponsored by NASA and the National Science Teachers Association, is an interdisciplinary program designed to address the need for greater literacy in the areas of science, critical and creative thinking, mathematics and technology. Over 10,000 students in elementary, junior high, and high school competed in five competition categories using their skills in mathematics, science, technology, art and creative writing.

The National Space Science Symposium brings together the 27 national winners and their teachers to recognize their academic achievement in an environment designed to further challenge their talents. The trip to the symposium includes formal presentations of their entries by the students.

In addition to their recognition in Washington, other awards include opportunities to intern at a NASA field center for a week during the summer, Space Camp scholarships, medals, ribbons and certificates. Winners of the Interplanetary Art competition will have their artwork displayed at the Marriott Metro Center Hotel during the symposium. Interested persons can view the display in Salons A, B and C through Tuesday, May 6. After the symposium, artwork will be on display in museums, schools and other public sites throughout this year.

On Monday, May 5, all events will be open to the press. Beginning at 8:30 a.m. EDT, the national winners of four of the competitions will present their winning proposals in Salons A,B and C. At 1 p.m., eight national semi-finalist high school student winners will present proposals for a Mars science experiment project to a panel of scientists. On Tuesday, May 6, students will tour the Capitol and meet their members of Congress.

-more-

At 6:30 p.m. on May 6, the students and their teachers will be honored at a banquet at the Marriott Metro Center Hotel. The banquet speaker will be Dr. Robert Parker, a former astronaut who is currently Director, Space Operations Utilization Program, Office of Space Flight, NASA Headquarters, Washington, DC.

Following is the list of competitions and winners.

Mars Science Experiment

Students in grades 9 -12 planned and developed a trip to Mars and proposed an experiment to be conducted along the way. Students were required to follow scientific research guidelines when designing the study. The following regional winners will compete for first place during the Symposium:

- Faisal Reza, Bronx High School of Science, Bronx, NY
- Marja Matthews, Anacostia High School, Washington, DC
- Elisabeth Grove, North Carolina School of Science and Mathematics, Durham, NC
- Mark Adams, Brussels American School, Brussels, Belgium
- Greg Hammel, Appleton East High School, Appleton, WI
- Katie Griffin, Shawnee Mission High School, Overland Park, KS
- Andrew Wong, Diamond Bar High School, Diamond Bar, CA
- Amy Frost, Laramie High School, Laramie, WY

Interplanetary Art Competition

Students in grades 3 - 12 expressed their talents in science and art by creating a two-dimensional illustration depicting a scene from interplanetary space and writing an essay describing the picture. The art work will be displayed for public viewing.

- Crystal Reiff, McCray-Dewey School, Troy, IL
- Aja Gibson, Southern Regional Middle School, Manahawkin, NJ
- Ariel Overstreet, Big Timber Grade School, Big Timber, MT

Future Aircraft/Spacecraft Design Competition

Students in grades 3 - 5 worked in teams to design a futuristic aircraft or spacecraft. The students created three illustrations and wrote an essay describing the spacecraft.

- Taylor Gray, Lindsay Hauge, Amber Overstreet, Big Timber Grade School, Big Timber, MT

Mission To Planet Earth

Students in grades 6 - 8, worked in three-person teams to create an interdisciplinary project using satellites to study the effects of human activity on the Earth's ecosystem. They used research methods and an understanding of technology to search for solutions to society's ecological problems.

- Steve Gold, Evan Volkman, Jonathan Jaffe, Michael Haendler, Bi-Cultural Day School, Stamford, CT

Aerospace Internship Competitions

Students in grades 9 - 12 competed for a one-week internship with their teacher/advisor at a NASA facility. Students were chosen on the basis of a written proposal of an experiment that could theoretically be performed at one of the facilities.

Supercomputer Internship

- Tomoya Ohno, Montgomery Blair H.S., Silver Spring, MD, will intern at NASA's Ames Research Center, Mountain View, CA, with scientists and engineers working on a Cray Computer.

Space Station Internship

- Maureen Morgan, Parma Senior H.S., Parma, OH, will intern at NASA's Johnson Space Center, Houston, TX, with scientists and engineers working on the Space Station.

Wind Tunnel Internship

- Leslie Shope, Montgomery Blair H.S., Silver Spring, MD, will intern at NASA's Langley Research Center, Hampton, VA, with scientists and engineers conducting research in aerodynamics using wind tunnels.

Microgravity Internship

- Eric Shang, Montgomery Blair H.S., Silver Spring, MD, will intern at NASA's Lewis Research Center, Cleveland, OH, with scientists performing microgravity experiments in a drop tube.

Spacelab Internship

- Anne Lee, Montgomery Blair H.S., Silver Spring, MD, will intern at NASA's Marshall Space Flight Center, Huntsville, AL, conducting experiments with scientists and engineers in the pressurized Spacelab module.

Space Telerobotics Internship

- Eric Schewe, Montgomery Blair H.S., Silver Spring, MD, will intern at NASA's Jet Propulsion Laboratory, Pasadena, CA, and work with engineers conducting research in the microrover laboratory for lunar and planetary surface exploration.

Space Astronomy Internship

- Mary Dombrowski, Glastonbury H.S., Glastonbury, CT, will intern at NASA's Goddard Space Flight Center, Greenbelt, MD, and work with astronomers conducting research in observational and theoretical astronomy and solar physics.

Launch Operations

- Christine Hwang, Montgomery Blair H.S., Silver Spring, MD, will intern at NASA's Kennedy Space Center, FL, and work with engineers on launch operations.

Atmospheric Flight Internship

- Jai Xu, Montgomery Blair H.S., Silver Spring, MD, will intern at NASA's Dryden Flight Research Center, and work with engineers on flight research programs.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Douglas Isbell
Headquarters, Washington, DC
(Phone: 202/358-1753)

April 30, 1997

Diane Ainsworth
Jet Propulsion Laboratory, Pasadena, CA
(Phone: 818/354-5011)

RELEASE: 97-85

MARS GLOBAL SURVEYOR TO AEROBRAKE IN MODIFIED CONFIGURATION

NASA's Mars Global Surveyor spacecraft can safely and successfully aerobrake into its final orbit around Mars this fall with its one partially deployed solar panel in a modified configuration, mission managers have decided.

No special maneuvers will be conducted to attempt to force the array to latch, and the focus of the Surveyor engineering team now will turn to minor modifications to the critical aerobraking phase that will circularize the spacecraft's orbit for the beginning of two years of science operations.

"After careful analysis of the situation, we've determined that the solar panel on Mars Global Surveyor that is not fully deployed presents very little risk to the mission," said Glenn E. Cunningham, Mars Global Surveyor project manager at NASA's Jet Propulsion Laboratory (JPL), Pasadena, CA.

The decision by NASA's flight team at JPL and its partners at Lockheed Martin Astronautics, Denver, CO, was reached after several months of extensive analysis of spacecraft data, ground-based computer simulations and a series of very slight spacecraft maneuvers that were carried out in January and February to characterize the situation.

"Thanks to an early launch that gave us an advantageous trajectory, we will not have to aerobrake into the Martian atmosphere as fast as we had originally planned to reach the mapping orbit, and that will reduce the amount of heating that the solar panels undergo during this gradual descent," Cunningham explained.

-more-

"We will rotate the solar-cell side of the panel that is not fully deployed by 180 degrees, so that it faces into the direction of the air flow that exerts drag force on the spacecraft as it dips repeatedly into the atmosphere," he said. "This way, the unlatched panel will not be in danger of folding up onto the spacecraft's main structure, nor will the panel be at any greater risk of heating up too much."

The solar panel in question is one of two 11-foot wings that were unfolded shortly after Surveyor's Nov. 7, 1996, launch from Cape Canaveral Air Station, FL. Data suggest that a piece of metal called the "damper arm," which is part of the solar array deployment mechanism located at the "elbow" joint where the entire panel is attached to the spacecraft body, probably was sheared off during deployment in the first day of flight. The lever that turns the shaft became wedged in a two-inch space between the shoulder joint and the edge of the solar panel, leaving the panel tilted at 20.5 degrees from its fully deployed and latched position.

Although the situation was never considered a serious threat to accomplishing the science objectives of the mission, the tilted array caused the JPL/Lockheed Martin flight team to re-evaluate the aerobraking phase, in which the spacecraft must rely almost solely on its solar panels for the drag needed to lower it into a nearly circular mapping orbit over the poles of the planet. This phase of the mission will begin a week after Mars Global Surveyor is captured in orbit around Mars on Sept. 11, and will last approximately four months.

Aerobraking was first tested in the final days of the Magellan mission to Venus in October 1994. The technique is an innovative method of braking which allows a spacecraft to carry less fuel to a planet and take advantage of the planet's atmospheric drag to descend into a low-altitude orbit.

Mars Global Surveyor will use an aerobraking phase much like that used to circularize Magellan's orbit. The solar wings -- which feature a Kapton flap at the tip of each wing for added drag -- supply most of the surface area that will slow the spacecraft by a total of more than 2,684 miles per hour during the four-month phase. Surveyor's orbit around Mars will shrink during this phase from an initial, highly elliptical orbit of 45 hours to a nearly circular orbit taking less than two hours to complete.

Engineers determined that the deployment springs currently holding the tilted solar panel in its nearly deployed position will not be strong enough to withstand the forces of aerobraking. To solve that problem, they designed a new configuration in which the tilted solar panel, along with the deployment springs, will be rotated 180 degrees, using a motor-driven inner gimbal actuator, and held in position with force applied by an outer gimbal actuator. Sequencing software will be modified to turn the gimbal actuators on before each closest approach to the planet and off at the conclusion of each drag pass.

-more-

As a consequence of the new aerobraking configuration, the more sensitive cell-side of the unlatched wing will be exposed directly to the wind flow of atmospheric entry, requiring that aerobraking be done in a more gradual, gentle manner. Ground tests have demonstrated that the unlatched solar panel will have more than adequate thermal margin to withstand additional heating as the spacecraft circularizes its orbit for the beginning of science mapping in March 1998.

Meanwhile, Mars Global Surveyor continues to perform very well on its arcing flight path toward the red planet and its arrival in orbit. A third, very minor trajectory correction maneuver, planned for April 21, was deemed unnecessary and canceled. In addition, science instrument calibrations continue to go well, and plans are being prepared to take an approach image of Mars a few days before the July 4 landing of Mars Pathfinder.

Mars Global Surveyor is the first mission in a sustained program of robotic exploration of Mars, managed by JPL for NASA's Office of Space Science, Washington, DC.

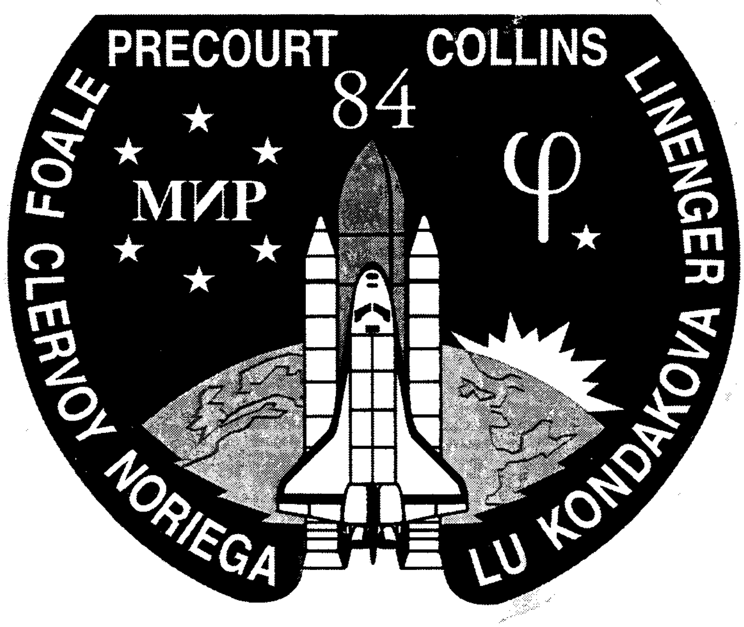
-end-

J97-15

National Aeronautics and Space Administration

SPACE SHUTTLE MISSION STS-84

PRESS KIT
May 1997



SHUTTLE MIR MISSION-6
(STS MIR-6)

NASA PAO CONTACTS

Debra Rahn/Mike Braukus Headquarters Washington, D.C.	Space Shuttle Mission, Interntional Cooperation Policy/Mgmt	202/358-1639
Rob Navias Johnson Space Center Houston, TX	NASA /Russia Phase 1 Cooperative Activities	281/483-8651
Kyle Herring / Ed Campion Johnson Space Center Houston, TX	Mission Operations / Astronauts	281/483-5111
Lisa Malone / Dave Dickinson Kennedy Space Center, FL	Launch Processing / KSC Landing Info.	407/867-2468
Fred Brown Dryden Flight Research Center Edwards, CA	DFRC Landing Info	805/258-2663
June Malone Marshall Space Flight Center Huntsville, AL	External Tank / Shuttle	205/544-7061

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Release: J97-15

ATLANTIS READY TO FLY SIXTH SHUTTLE-MIR MISSION

The continuing cooperative effort in space exploration between the United States and Russia will be the focus of NASA's fourth Shuttle mission of 1997 with the launch of Space Shuttle Atlantis on Mission STS-84.

This is the sixth of nine planned missions to Mir and the third one involving an exchange of U.S. astronauts. Astronaut Jerry Linenger, who has been on Mir since mid-January, will be replaced by astronaut Mike Foale. Foale will spend more than four months on the orbiting Russian facility. He will return to Earth on Space Shuttle Mission STS-86, scheduled for launch in late September.

Atlantis will again be carrying the SPACEHAB module in the payload bay of the orbiter. The double module configuration will house experiments to be performed by Atlantis' crew along with logistics equipment to be transferred to Mir.

The STS-84 crew will be commanded by Charlie Precourt who will be making his third Shuttle flight. The pilot, Eileen Collins, will be making her second flight. There are five mission specialists assigned to this flight. Jean-Francois Clervoy from the European Space Agency (ESA), serving as Mission Specialist-1, is making his second flight. Mission Specialist-2 Carlos Noriega and Mission Specialist-3 Ed Lu are both making their first space flight. Elena Kondakova from the Russian Space Agency, serving as Mission Specialist-4, is making her first flight on the Shuttle and second space flight having flown previously on the Mir space station. Mike Foale, making his fourth space flight, will be Mission Specialist-5 for launch through docking with Mir. Shortly after docking, Foale and Linenger will conduct their handover with Foale becoming a member of the Mir crew and Linenger becoming STS-84 Mission Specialist-6 through the end of the flight.

Atlantis is targeted for an early morning launch on May 15, 1997 from NASA's Kennedy Space Center Launch Complex 39-A. The current launch time of 4:08 a.m. EDT may vary slightly based on calculations of Mir's precise location in space at the time of liftoff due to Shuttle rendezvous phasing requirements. The STS-84 mission is scheduled to last 9 days, 3 hours, 44 minutes. An on-time launch on May 15 and nominal mission duration would have Atlantis landing back at Kennedy Space Center on May 24 at about 7:52 a.m. EDT.

Atlantis' rendezvous and docking with the Mir actually begin with the precisely timed launch setting the orbiter on a course for rendezvous with the orbiting Russian facility. Over the next two to three days, periodic firings of Atlantis' small thruster engines will gradually bring the Shuttle within closer proximity to Mir.

The STS-84 mission is part of the NASA/Mir program which consists of nine Shuttle-Mir dockings and seven long duration flights of U.S. astronauts aboard the Russian space station. The U.S. astronauts will launch and land on a Shuttle and serve as Mir crew members while the Mir cosmonauts use their traditional Soyuz vehicle for launch and landing. This series of missions will expand U.S. research on Mir by providing resupply materials for experiments to be performed aboard the station as well as returning experiment samples and data to Earth.

The current Mir 23 mission began when cosmonauts Vasily Tsibliev and Alexander Lazutkin and German Researcher Reinhold Ewald of DARA were launched on Feb. 10, 1997, in a Soyuz vehicle and docked with the Mir two days later. Jerry Linenger began his stay on the orbiting Russian facility with the Mir 22 crew in mid-January with the docking of STS-81. He became a member of the Mir 23 crew and continued his science investigations when the Mir 22 crew and Ewald returned to Earth on March 2. After Linenger and Foale complete their handover, Foale will work with the Mir 23 crew until the arrival of Mir 24 cosmonauts Anatoly Solovyev, Pavel Vinogradov and ESA Researcher Leopold Eyharts in August 1997. After the Mir 23 crew and Eyharts return to Earth in a Soyuz vehicle, Foale will complete his tour with the Mir 24 crew. Foale will be replaced by NASA Astronaut Wendy Lawrence when Atlantis again docks with Mir in late September.

The STS-84 mission and the work performed by Foale during his time on the Mir station will include investigations in the fields of advanced technology, Earth sciences, fundamental biology, human life sciences, International Space Station risk mitigation, microgravity sciences and space sciences.

STS-84 will involve the transfer of 7,314 pounds of water and logistics to and from the Mir. During the docked phase, 1,025 pounds of water, 844.9 pounds of U.S. science equipment, 2,576.4 pounds of Russian logistics along with 392.7 pounds of miscellaneous material will be transferred to Mir. Returning to Earth aboard Atlantis will be 897.4 pounds of U.S. science material, 1,171.2 pounds of Russian logistics, 30 pounds of ESA material and 376.4 pounds of miscellaneous material.

STS-84 will be the 19th flight of Atlantis and the 84th mission flown since the start of the Space Shuttle program in April 1981.

MEDIA SERVICES INFORMATION

NASA Television Transmission

NASA Television is now available at a new satellite location. NASA TV is now available through the GE2 satellite system which is located on Transponder 9C, at 85 degrees west longitude, frequency 3880.0 MHz, audio 6.8 MHz.

The schedule for television transmissions from the orbiter and for mission briefings will be available during the mission at Kennedy Space Center, FL; Marshall Space Flight Center, Huntsville, AL; Dryden Flight Research Center, Edwards, CA; Johnson Space Center, Houston, TX; and NASA Headquarters, Washington, DC. The television schedule will be updated to reflect changes dictated by mission operations.

Status Reports

Status reports on countdown and mission progress, on-orbit activities and landing operations will be produced by the appropriate NASA newscenter.

Briefings

A mission press briefing schedule will be issued before launch. During the mission, status briefings by a flight director or mission operations representative and when appropriate, representatives from the payload team, will occur at least once each day. The updated NASA television schedule will indicate when mission briefings are planned.

Internet Information

Information on STS-83 is available through several sources on the Internet. The primary source for mission information is the NASA Shuttle Web, part of the World Wide Web. This site contains information on the crew and their mission and will be regularly updated with status reports, photos and video clips throughout the flight. The NASA Shuttle Web's address is:

http://shuttle.nasa.gov

If that address is busy or unavailable, Shuttle information is available through the Office of Space Flight Home Page:

http://www.osf.hq.nasa.gov/

General information on NASA and its programs is available through the NASA Home Page and the NASA Public Affairs Home Page:

http://www.nasa.gov

or http://www.gsfc.nasa.gov/hqpao/hqpao_home.html

Information on other current NASA activities is available through the Today@NASA page:

http://www.hq.nasa.gov/office/pao/NewsRoom/today.html

The NASA TV schedule is available from the NTV Home Page:

http://www.hq.nasa.gov/office/pao/ntv.html

Status reports, TV schedules and other information also are available from the NASA Headquarters FTP (File Transfer Protocol) server, ftp.hq.nasa.gov. Log in as anonymous and go to the directory /pub/pao. Users should log on with the user name "anonymous" (no quotes), then enter their E-mail address as the password. Within the /pub/pao directory there will be a "readme.txt" file explaining the directory structure:

* Pre-launch status reports (KSC): **ftp.hq.nasa.gov/pub/pao/statrpt/ksc**
* Mission status reports(JSC): **ftp.hq.nasa.gov/pub/pao/statrpt/jsc**
* Daily TV schedules: **ftp.hq.nasa.gov/pub/pao/statrpt/jsc/tvsked.**

NASA Spacelink, a resource for educators, also provides mission information via the Internet. Spacelink may be accessed at the following address:

http://spacelink.msfc.nasa.gov

Access by CompuServe

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STS-84 QUICK LOOK

Launch Date/Site: May 15, 1997/KSC Launch Pad 39-A
Launch Time: 4:08 A.M. EST
Launch Window: 7 minutes
Orbiter: Atlantis (OV-104), 19th flight
Orbit Altitude/Inclination: 160 nautical miles, 51.6 degrees
213 nautical miles at docking
Mission Duration: 9 days, 3 hours, 44 minutes
Landing Date: May 24, 1997
Landing Time: 7:52 A.M. EDT
Primary Landing Site: Kennedy Space Center, Florida
Abort Landing Sites: Return to Launch Site - KSC
Transoceanic Abort Sites - Zaragoza, Spain
Ben Guerir, Morocco
Moron, Spain
Abort-Once Around - Kennedy Space Center

Crew: Charlie Precourt, Commander (CDR), 3rd flight
Eileen Collins, Pilot (PLT), 2nd flight
Jean-Francois Clervoy (ESA), Mission Specialist 1, 2nd flight
Carlos Noriega, Mission Specialist 2, 1st flight
Ed Lu, Mission Specialist 3, 1st flight
Elena Kondakova (RSA), Mission Specialist 4, 1st flight
Mike Foale, Mission Specialist 5, 4th flight, ascent-docking
Jerry Linenger, Mission Specialist 6, 2nd flight, docking-landing

EVA Crewmembers: Jean-Francois Clervoy (EV 1), Ed Lu (EV 2)
(if needed, contingency)

Cargo Bay Payloads: Orbiter Docking System
Spacehab-DM
European Proximity Sensor

In-Cabin Payloads: SIMPLEX
MSX
CREAM
RME's

CREW RESPONSIBILITIES

Payloads	Prime	Backup
Spacehab Systems	Clervoy	Kondakova
Spacehab Science	Clervoy	Lu, Kondakova
Orbiter Docking System	Clervoy	Others
ESA Prox Ops Sensor	Collins	Noriega
Russian Logistics Transfers	Lu	Clervoy
Mir Structural Dynamics Tests	Precourt	Collins
Mir Photographic Surveys	Lu	Collins
SIMPLEX	Collins	Precourt
MSX	Precourt	Collins
Joint U.S.-Russian Science	Kondakova, Foale	Lu, Noriega
EVA	Clervoy (EV 1)	Lu (EV 2)
Intravehicular Crew Member	Noriega	----
Earth Observations	Collins	Noriega
Russian Language	Kondakova	Foale

Developmental Test Objectives
Detailed Supplementary Objectives
Risk Mitigation Experiments

DTO 255: Wraparound DAP Flight Test Verification
DTO 312: External Tank TPS Performance
DTO 416: Water Spray Boiler Quick Restart Capability
DTO 663: Acoustical Noise Dosimeter Data
DTO 700-10 Orbiter Space Vision System Videotaping
DTO 700-12 Global Positioning System/Inertial Navigation System
DTO 700-14: Single String Global Positioning System
DTO 805: Crosswind Landing Performance
DTO 1118: Photographic and Video Survey of Mir Space Station

DSO 331: Integration of the Space Shuttle Launch and Entry Suit
DSO 487: Immunological Assessment of Crewmembers
DSO 802: Educational Activities

RME 1302: Mir Electrical Characteristics
RME 1303: Shuttle/Mir Experiment Kit Transport
RME 1312: Realtime Radiation Monitor Device
RME 1314: ESA Proximity Operations Sensor
RME 1317: Mir Structual Dynamics Experiment
RME 1318: Treadmill Vibration Isolation System B

PAYLOAD AND VEHICLE WEIGHTS

Vehicle/Payload	Pounds
Orbiter (Atlantis) empty and 3 SSME's	152,178
Shuttle System at SRB Ignition	4,512,109
Orbiter Weight at Landing with Cargo	221,087
Spacehab-DM	9,231
Orbiter Docking System	4,016

STS-84 ORBITAL EVENTS SUMMARY

(based on a May 15, 1997 launch)

EVENT	MET	TIME OF DAY (EDT)
Launch	0/00:00	4:08 AM, May 15
Docking	1/18:30	10:38 PM, May 16
Hatch Opening	1/20:20	12:28 AM, May 17
Crew News Conference	6/02:00	5:08 AM, May 21
Undocking	6/16:56	9:04 PM, May 21
KSC Landing	9/03:44	7:52 AM, May 24

(Mission Elapsed Time for all events will change for launch dates beyond May 15 because of rendezvous requirements for Atlantis to reach the Mir Space Station)

MISSION SUMMARY TIMELINE

Flight Day One:
Launch/Ascent
OMS-2 Burn
Payload Bay Door Opening
Spacehab Activation
Rendezvous Maneuvers

Flight Day 2:
Spacehab Experiment Operations
Centerline Camera Mount
Rendezvous Tool Checkout
VHF Radio Setup and Checkout
Rendezvous Maneuvers
Water Bag Fills

Flight Day 3:
Rendezvous Maneuvers
Mir Docking
Hatch Opening/Welcoming Ceremony
Soyuz Seatliner and Installation
Crew Transfer
Spacehab Experiment Operations

Flight Day 4:
Spacehab Experiment Operations
Elektron Transfer
Logistics Transfers
Foale/Linenger Handover

Flight Day 5:
Logistics Transfers
Spacehab Experiment Operations
Mir Structual Dynamics Tests
Foale/Linenger Handover

Flight Day 6:
Logistics Transfers
Spacehab Experiment Operations
Foale/Linenger Handover

Flight Day 7:
Mir Tour
Final Logistics Transfers
Final Foale/Linenger Handover
Crew News Conference and Farewell Ceremony
Hatch Closing

Flight Day 8:
Mir Undocking and Seperation
Transfer Item Stowage
Off-Duty Time

Flight Day 9:
Flight Control System Checkout
Reaction Control System Hot-Fire
Cabin Stowage
Deorbit Preparation and Entry Review

Flight Day 10:
Spacehab Deactivation
Recumbent Seat Setup
Deorbit Preparation
Deorbit Burn
KSC Landing

SHUTTLE ABORT MODES

Space Shuttle launch abort philosophy aims toward safe and intact recovery of the flight crew, Orbiter and its payload. Abort modes for STS-84 include:

* Abort-To-Orbit (ATO) -- Partial loss of main engine thrust late enough to permit reaching a minimal 105-nautical mile orbit with the orbital maneuvering system engines.

* Abort-Once-Around (AOA) -- Earlier main engine shutdown with the capability to allow one orbit of the Earth before landing at the Kennedy Space Center, FL.

* Transoceanic Abort Landing (TAL) -- Loss of one or more main engines midway through powered flight would force a landing at either Zaragoza or Moronin Spain or Ben Guerir in Morocco.

* Return-To-Launch-Site (RTLS) -- Early shutdown of one or more engines, and without enough energy to reach a TAL site, would result in a pitch around and thrust back toward Kennedy until within gliding distance.

STS-84 MIR RENDEZVOUS, DOCKING & UNDOCKING

Atlantis' rendezvous and docking with the Russian Space Station Mir actually begins with the precisely timed launch of the shuttle on a course for the Mir, and, over the next two days, periodic small engine firings that will gradually bring Atlantis to a point eight nautical miles behind Mir on docking day, the starting point for a final approach to the station.

Mir Rendezvous & Docking-- Flight Day 3

About two hours before the scheduled docking time on Flight Day Three of the mission, Atlantis will reach a point about eight nautical miles behind the Mir Space Station and conduct a Terminal Phase Initiation (TI) burn, beginning the final phase of the rendezvous. Atlantis will close the final eight nautical miles to Mir during the next orbit. As Atlantis approaches, the shuttle's rendezvous radar system will begin tracking Mir and providing range and closing rate information to Atlantis. Atlantis' crew also will begin air-to-air communications with the Mir crew using a VHF radio.

As Atlantis reaches close proximity to Mir, the Trajectory Control Sensor, a laser ranging device mounted in the payload bay, will supplement the shuttle's onboard navigation information by supplying additional data on the range and closing rate. As Atlantis closes in on the Mir, the shuttle will have the opportunity for four small successive engine firings to fine-tune its approach using its onboard navigation information. Identical to prior Mir dockings, Atlantis will aim for a point directly below Mir, along the Earth radius vector (R-Bar), an imaginary line drawn between the Mir center of gravity and the center of Earth. Approaching along the R-Bar, from directly underneath the Mir, allows natural forces to assist in braking Atlantis' approach. During this approach, the crew will begin using a hand-held laser ranging device to supplement distance and closing rate measurements made by other shuttle navigational equipment.

The manual phase of the rendezvous will begin just as Atlantis reaches a point about a half-mile below Mir. Commander Charlie Precourt will fly the shuttle using the aft flight deck controls as Atlantis begins moving up toward Mir. Because of the approach from underneath Mir, Precourt will have to perform very few braking firings. However, if such firings are required, the shuttle's jets will be used in a mode called "Low-Z," a technique that uses slightly offset jets on Atlantis' nose and tail to slow the spacecraft rather than firing jets pointed directly at Mir. This technique avoids contamination of the space station and its solar arrays by exhaust from the shuttle steering jets.

Using the centerline camera fixed in the center of Atlantis' docking mechanism, Precourt will center Atlantis' docking mechanism with the Docking Module mechanism on Mir, continually refining this alignment as he approaches within 300 feet of the station.

At a distance of about 30 feet from docking, Precourt will stop Atlantis and stationkeep momentarily to adjust the docking mechanism alignment, if necessary. At that time, a final go or no- go decision to proceed with the docking will be made by flight control teams in both Houston and Moscow.

When Atlantis proceeds with docking, the shuttle crew will use ship-to-ship communications with Mir to inform the Mir crew of the shuttle's status and to keep them informed of major events, including confirmation of contact, capture and the conclusion of damping. Damping, the halt of any relative motion between the two spacecraft after docking, is performed by shock absorber-type springs within the docking device. Mission Specialist Jean-Francois Clervoy will oversee the operation of the Orbiter Docking System from onboard Atlantis.

Undocking and Separation

Once Atlantis is ready to undock from Mir, the initial separation will be performed by springs that will gently push the shuttle away from the docking module. Both the Mir and Atlantis will be in a mode called "free drift" during the undocking, a mode that has the steering jets of each spacecraft shut off to avoid any inadvertent firings.

Once the docking mechanism's springs have pushed Atlantis away to a distance of about two feet from Mir, where the docking devices will be clear of one another, Atlantis' steering jets will be turned back on and fired in the Low-Z mode to begin slowly moving away from Mir.

For the STS-84 mission, Atlantis will continue away from Mir until it reaches a distance of 3,000 feet below the Mir in order to test a European laser docking sensor. Unlike previous Shuttle-Mir flights, there will be no fly-around of the station for photo documentation. When Atlantis reaches the 3,000 foot distance, instead of firing jet thrusters to perform a separation maneuver, the Shuttle will depend on the natural forces of one spacecraft being in a lower orbit than another which will cause the Shuttle to move ahead of the Mir.

Testing of new rendezvous and docking technology

New ESA-developed technology will be tested during the Shuttle's approach and departure from Mir. A GPS receiver and an optical rendezvous sensor on the Shuttle, together with equipment already installed on Mir, will be operated for the first time in space in an enactment of how ESA's unmanned Automated Transfer Vehicle (ATV) will approach and depart the International Space Station when it delivers supplies to it early in the next century.

During the long-range approach to Mir (starting 3 hours before docking), ESA's European Proximity Operations Sensor GPS receivers on Atlantis and Mir will receive data from Navstar Global Positioning Satellites on the position of the other craft. The accuracy of that relative navigational data will later be compared with true data from the Shuttle's rendezvous radar.

When the Shuttle is at 170 feet from Mir, the short-range experiment will begin. Navigation will be handed over to the optical rendezvous sensor. Data will again later be compared to true figures, this time supplied by the NASA Trajectory Control System (TCS), a laser ranging device in the payload bay.

The experiments will be repeated during the departure. To allow that, the method that Atlantis will use to move away from Mir had to be changed. For the first time, the Shuttle will stay on the vertical, dropping to 1000 metres below Mir before resuming its traditional path.

This test is one in a series of three flight demonstrations. The GPS elements of the system were tested on STS-80 in November 1996 and a further full flight test will be on the seventh Shuttle-Mir docking mission in September.

SHUTTLE-MIR SCIENCE

The NASA/Mir program is now into the Phase 1B portion, which consists of nine Shuttle-Mir dockings and seven long-duration flights of U.S. astronauts aboard the Russian space station between early 1996 and late 1998. The U.S. astronauts will launch and land on a Shuttle and serve as a Mir crewmember for flight durations ranging from 127 to 187 days, while the Mir cosmonauts stay approximately 180 days and use their traditional Soyuz vehicle for launch and landing. This series of missions will expand U.S. research on Mir by providing resupply materials for experiments to be performed aboard Mir as well as returning experimental samples and data to Earth.

The Mir 23 mission began when the Cosmonaut crew launched on February 10, 1997, in a Soyuz vehicle and docked with the Mir two days later. Jerry Linenger joined the Mir 22 crew with the January 14, 1997 docking of Atlantis during Mission STS-81. The return of Atlantis on STS-84 will conclude some experiments, continue others and commence still others. Data gained from the mission will supply insight for the planning and development of the International Space Station, Earth-based sciences of human and biological processes, and the advancement of commercial technology.

Science Overview

As scientists learn more about the effects of the space environment, they continue to develop questions from the fields of human life sciences, fundamental biology, biotechnology, material sciences, and spacecraft structural and environmental dynamics. Valuable scientific information regarding these subjects will be returned from the NASA/Mir Program disciplines of advanced technology, Earth sciences, fundamental biology, human life sciences, International Space Station risk mitigation, microgravity sciences and space sciences. This knowledge will assist researchers in developing future space stations, science programs, procedures for those facilities, and advance the knowledge base of these areas to the benefit of all people on Earth.

The advanced technology discipline will evaluate new technologies and techniques using the Space Shuttle as a test bed. An increased understanding of fluid handling and control can lead to enhanced an technological base for implementation on the International Space Station and other future space vehicles.

Earth sciences research in ocean biochemistry, land surface hydrology, meteorology, and atmospheric physics and chemistry also will be performed. Observation and documentation of transient natural and human-induced changes will be accomplished with the use of passive microwave radiometers, a visible region spectrometer, a side-looking radar, and hand-held photography. Residence in Earth orbit will allow for documentation of atmospheric conditions, ecological and unpredictable events, and seasonal changes over long time periods.

Fundamental biology research continues developmental investigations in the study of the effects of the space environment on the biological systems of plants. Prolonged exposure to microgravity provides an ideal opportunity to determine the role gravity has on plant cell regulation and how this affects development and growth. Other investigations under this discipline will study the effect of space flight on circadian rhythms in the black-bodied beetle and will characterize the internal radiation environment of the Mir space station.

Human life sciences research consists of investigations that focus on the crewmember's adaptation to weightlessness in terms of skeletal muscle and bone changes, neurosensory function, psychological interactions, and the role of sleep during space flight in the observed changes in circadian rhythmicity. vestibular function, and immune system function. In the Space Medicine Program, environmental factors such as water quality, air quality, surface assessment for microbes, and crew microbiology will be assessed. These ambitious investigations will continue the characterization of the integrated human responses to a prolonged presence in space.

The International Space Station risk mitigation discipline consists of several technology demonstrations associated with human factors and maintenance of crew health and safety aboard the space station. In order to improve the design and operation of the International Space Station, information is gathered to fully evaluate the Mir interior and exterior environments. This discipline includes investigations of radio interference, crew force impacts to structures, particle impact on the station, docked configuration stability, water microbiological monitoring and radiation monitoring.

Microgravity research will advance scientific understanding through research in biotechnology, fluid physics, and materials science. The ambient acceleration and vibration environment of Mir will be characterized to support future research programs.

Most of the Mir 24/NASA research will be conducted on the Mir; however, Shuttle-based experiments will be conducted in the middeck and SPACEHAB modules of STS-84.

Fundamental Biology

The microgravity environment on a long duration mission provides an ideal opportunity to determine the role gravity plays in molecular mechanisms at a cellular level and in regulatory and sensory mechanisms. An experiment using mustard plants will study how this affects development and fundamental biological growth. An experiment with black-bodied beetles will measure how space flight factors change circadian rhythms.

Fundamental biology will also characterize the radiation of the Mir environment and determining how it may impact station-based science.

Environmental Radiation Measurements

Exposure of crew, equipment, and experiments to the ambient space radiation environment in low Earth orbit poses one of the most significant problems to long term space habitation. As part of the collaborative NASA/Mir Science program, a series of measurements is being compiled of the ionizing radiation levels aboard Mir. During the mission, radiation will be measured in six separate locations throughout the Mir using a variety of passive radiation detectors. This experiment will continue on later missions, where measurements will be used to map the ionizing radiation environment of Mir. These measurements will yield detailed information on spacecraft shielding in the 51.6-degree-orbit of the Mir. Comparisons will be made with predictions from space environment and radiation transport models.

Greenhouse-Integrated Plant Experiments

The microgravity environment of the Mir space station provides researchers an outstanding opportunity to study the effects of gravity on plants, specifically mustard plants. The greenhouse experiment determines the effects of space flight on plant growth, reproduction, metabolism, and production. By studying the chemical, biochemical, and structural changes in plant tissues, researchers hope to understand how processes such as photosynthesis, respiration, transpiration, stomatal conductance, and water use are affected by the space station environment. This study is an important area of research, due to the fact that plants could eventually be a major contributor to life support systems for space flight. Plants produce oxygen and food, while eliminating carbon dioxide and excess humidity from the environment. These functions are vital for sustaining life in a closed environment such as the Mir or the International Space Station.

Mustard is planted and grown in the "Svet," a Russian/Slovakian developed plant growth facility, where photosynthesis, transpiration, and the physiological state of the plants are monitored. The plants are observed daily, and photographs and video images are taken. Samples are also collected at certain developmental stages, fixed or dried, and returned to Earth for analysis.

Human Life Sciences Project

The task of safely keeping men and women in space for long durations, whether they are doing research in Earth orbit or exploring other planets in our solar system, requires continued improvement in our understanding of the effects of spacefight factors on the ways humans live and work. The Human Life Sciences (HLS) project has a set of investigations planned for the Mir 24/NASA 5 mission to determine how the body adapts to weightlessness and other space flight factors, including the psychological aspects of a confined environment and how they readapt to Earth's gravitational forces. The results of these investigations will guide the development of ways to minimize any negative effects so that crewmembers can remain healthy and efficient during long flights, as well as after their return to Earth.

Protein Crystal Growth

Protein Crystal Growth (PCG) experiments will be conducted in three facilities - the Gaseous Nitrogen Dewar (GND) facility, the Diffusion-Controlled Crystallization Apparatus for Microgravity (DCAM) facility and the Second-Generation Vapor Diffusion Apparatus (VDA-2) facility.

Diffusion-Controlled Crystallization Apparatus for Microgravity

The Diffusion-Controlled Crystallization Apparatus for Microgravity (DCAM) is designed to grow protein crystals at slow, controlled rates in the microgravity environment of space. The crew of Space Shuttle Atlantis will retrieve protein samples which have been growing in the DCAM on the Russian Mir space station since January 1997, and replace them with new samples. Protein crystals are used in basic biological research, pharmacology and drug development. Earth's gravity affects the purity and structural integrity of crystals. The low-gravity environment in space allows for the growth of larger, purer crystals of greater structural integrity. Analyses of some protein crystals grown in space have revealed more about a protein's molecular structure than crystals grown on Earth. DCAM -- a little larger than a 35 mm film can -- has produced promising crystals in a long stay abroad the Mir space station.

Crew members will remove 162 "growing" samples and replace them with 162 new samples. The DCAM passively controls the crystallization.

The new samples will remain aboard Mir until September 1997, when they will be transported back to Earth on the STS-86 Shuttle flight.

Dr. Daniel Carter, New Century Pharmaceuticals Inc., Huntsville, Ala. Is the principal investigator for the DCAM facility.

Gaseous Nitrogen Dewar

Frozen protein samples will be transported to the Russian Mir space station in a Gaseous Nitrogen Dewar (GND) on STS-84, and the existing protein crystals on board Mir from the STS-81 mission will be returned to Earth for laboratory analysis.

This investigation is expected to contribute to the understanding of why proteins grow differently in the microgravity environment of space.

The GND is a vacuum jacketed container with an absorbent inner liner saturated with liquid nitrogen. The approximately 19 individual protein samples will remain frozen for approximately two weeks, until the liquid nitrogen has completely boiled off. This provides ample time to transport and transfer the Dewar to the Mir station. After the liquid nitrogen is completely discharged, the samples will thaw to ambient temperature and protein crystals will crystallize and grow over the four-month duration of the mission.

Dr. Alexander McPherson, University of California, Riverside is the principal investigator for the GND facility.

Second-Generation Vapor Diffusion Apparatus (VDA-2)

The experiment will grow high-quality crystals of various proteins using the vapor diffusion method. In addition, the experiment is expected to foster protein crystal growth research. Investigators associated with this study are from several international universities and research institutes.

Production of high-quality crystals is critically important in drug design. Results of studies of enzyme crystal structures are used to design new drugs to treat chronic conditions and diseases.

The Vapor Diffusion Apparatus -- which has flown previously on 22 missions -- uses the ground-based Òhanging dropÓ method of growing protein crystals. The apparatus includes four trays -- each containing 20 experiment chambers. The 80 chambers contain approximately 15 different proteins in a variety of mixtures.

Before launch, protein and precipitant solutions are loaded into two barrels of triple-barreled syringes, with the third barrel used for mixing. Each syringe protrudes into an experiment chamber surrounded by a reservoir.

The four VDA-2 trays are installed in a Commercial Refrigerator/Incubator Module (CRIM) and are maintained at 72 degrees Farenheit. At approximately 12 hours into the mission, the experiment is activated. The protein and precipitant solutions are mixed to form a droplet. Water diffuses from the hanging droplet through the vapor space into the more concentrated reservoir solution. As the protein droplet becomes more concentrated, protein crystals grow. Temperatures in the CRIM -- monitored and recorded during the flight -- are changed gradually over several days to cause the protein solution to form protein crystals. The change in CRIM temperature is transferred from the temperature-controlled plate through the cylinder lids to the protein solution. Protein crystal growth continues until about one day before landing, when the experiment is deactivated.

Dr. Larry DeLucas at the Center for Macromolecular Crystallography, University of Alabama at Birmingham is the principal investigator. The project is managed by the Biotechnology Office of the Microgravity Research Program Office at the Marshall Space Flight Center in Huntsville, Ala.

Optical Properties Monitor (OPM)

OPM is the first experiment capable of relaying data from in orbit which will measure the effect of the space environment on optical properties, such as those of mirrors used in telescopes, and structural elements, such as the coatings used on space hardware. OPM instruments will measure various optical properties of the, overall showing to what extent the samples deteriorate over the course of the experiment.

American astronaut Jerry Linenger and Mir 23 Commander Vasily Tsibliev performed a spacewalk on April 29 during which they attached the monitor to the outside of the space station. This marked the first experiment deployed jointly by the U.S. and Russia, setting the stage for how the astronauts and cosmonauts will work together on the International Space Station.

During its scheduled nine months on Mir, the experiment will measure the environment's effect on nearly 100 sample materials. The monitor will be the first externally powered experiment in space, using a power-data line to receive power from and transmit information to the Mir. The monitor will collect and store measurements to be transferred weekly to a Mir computer, then to scientists on Earth.

Information gathered will be used to improve designs of optical and structural elements of spacecraft, particularly the International Space Station. It will also be used to plan maintenance schedules for in-orbit satellites, based on measured rates of degradation.

OPM was developed by NASA's Marshall Space Flight Center and AZ Technology of Huntsville, AL. It is scheduled to be retrieved from Mir in February 1998 during the STS-89 mission. The Principal Investigator is Donald Wilkes of AZ Technology in Huntsville, AL.

EUROPEAN SPACE AGENCY (ESA)

Europe is playing a major part in the STS-84 mission - ESA astronaut Jean-Francois Clervoy is onboard as a member of the STS-84 crew along with important ESA science facilities, experiments and technology equipment.

ESA astronaut on board

Astronaut Jean-Francois Clervoy is making his second spaceflight. His first was as a Mission Specialist in November 1994 on STS-66, the Atmospheric Laboratory for Applications and Science-3 (ATLAS-3) mission.

He has a number of crucial tasks on STS-84, including flight engineer during lift-off, rendezvous and docking; payload commander; coordinating the transfer of the four tons of supplies between the two craft; and performing any contingency spacewalks needed.

Clervoy joined the ESA astronaut corps in 1992. Before that, in 1991 and as a French astronaut, he trained in Star City, Russia, on the Mir and Soyuz systems. He is fluent in Russian.

Biorack experiments

The Spacehab houses ESA's Biorack and the MOMO experiment. Biorack - the main science payload on board - is one of Europe's most successful and versatile space facilities. This large multi-purpose unit provides temperature-controlled environments, centrifuges for simulating gravity and a protected workspace for specimen handling, all integrated into a single rack. Now on its sixth flight, it is carrying a total of 10 experiments from France, Germany and the United States.

The cytoskeleton of the lentil root statocyte
Dominique Driss-Ecole, Pierre et Marie Curie University, Paris, France

If fresh food is to be grown on future space stations and long missions it is important to know how microgravity affects plant growth, particularly the development of starch which influences food value. This experiment - flying for the sixth time on Biorack - will use time-lapse photography to build on results from previous studies that have shown plants containing starch-producing amyloplasts behave differently in microgravity. Lentil seedlings will be grown in microgravity for 27 hours and then slightly fixed to allow analysis. Photography will follow the oscillations of the root tips and allow studies to be made of the root structure.

Morphology and physiology of Loxodes after cultivation in space
Ruth Hemmersbach, DLR-Institute of Aerospace Medicine, Cologne, Germany

Several generations of the single-celled organism Loxodes striatus will be grown to study the effect of microgravity on the health, shape, size and number of cells, and amounts of DNA. Complementary ground-based studies will also be carried out. This experiment will contribute to our understanding of bone decalcification under space conditions.

The effect of microgravity on normal vestibulo-ocular reflex development
Eberhard R. Horn, University of Ulm, Germany

To enhance understanding of vestibular/ocular development in all vertebrates, the experiment will compare the growth of four groups of tadpoles and two groups of fish embryos exposed to various periods of microgravity.

Repair of radiation damage under microgravity
Jurgen Kiefer, University of Giessen, Germany

A repair-deficient mutant of the yeast Saccharomyces cerevisiae (which cannot repair radiation damage at certain temperatures) will be irradiated in-flight for several days to determine the ability of cells to repair radiation damage in microgravity. Ground controls and experiments on a 1g centrifuge in space will allow a well-defined assessment of cellular repair capability.

Dosimetric mapping inside Biorack
Gunther Reitz, DLR-Institute of Aerospace Medicine, Cologne, Germany

When cell-damaging ionising radiation passes through spacecraft shielding, it yields secondary products such as neutrons and fragments of nuclear disintegrations. This experiment uses passive and active detectors to improve knowledge of the radiation environment inside a spacecraft.

Lymphocyte and monocyte intra-cellular signal transduction in **microgravity**
Didier A. Schmitt, Blood Transfusion Centre, Strasbourg, France

This experiment will determine the effect of microgravity on the distribution of the Protein Kinase C enzyme between different parts of white blood cells, which play an important role in the immune system.

Microgravity effects on bone cell gene expression
Millie Hughes-Fulford, University of California, San Francisco, USA

During the flight, bone-forming cell cultures (osteoblasts) will be activated and fixed while exposed to different levels of gravity. Subsequent analysis will look at how microgravity affects bone loss, an important factor for astronauts spending long periods in orbit.

Microgravity and signal transduction pathways in sea urchin sperm
Joseph S. Tash, Univ. of Kansas Medical Center, Kansas, USA

A series of related experiments that will expand previous knowledge on how gravity affects sperm function and motility.

Graviperception in starch-deficient plants
John Z. Kiss, Miami University, Oxford, Ohio, USA

Using starch-deficient mutants, this experiment is expected to clear up the role of starch grains in plants roots by confirming a correlation between gravity-induced root curvature and starch content. In previous studies, the strongest gravity-induced root curvature has been from plants with the highest starch content.

Effect of microgravity on lymphocyte activation: cell-cell interaction and signalling
Clarence F. Sams, Johnson Space Center, Houston, Texas, USA

Weightlessness may interfere with activation of white blood cells and this study will help determine parameters under which microgravity alters this.

Understanding the effects of gravity at cellular level will support immunology studies, cancer research and cellular biology.

MOMO experiment

The MOMO experiment (Morphological Transition and Model Substances) will investigate solidification, one of the most fundamental processes in the industrial production of materials.

On Earth, solidification is affected by gravity, causing a buoyancy-driven convective flow in molten material. In space, gravity-driven convection is effectively eliminated, providing the opportunity to look at its effect on interface morphology.

One area of key interest is the surface shape and structure of growing solid material. In this experiment, housed in a Spacehab Self-standing Drawer, the transparent liquid alloy Succinonitril-acetone, whose solidification behaviour is similar to that of metals, will be used to allow in-situ optical observation of crystal growth. Some 1000 images of the solidification process will be recorded for later comparison with similar experiments performed on the ground.

STS-84 CREW BIOGRAPHIES

CHARLES J. PRECOURT (Colonel, USAF)
STS-84 Commander

PERSONAL DATA - Born June 29, 1955, in Waltham, Massachusetts, but considers Hudson, Massachusetts, to be his hometown. Married to the former Lynne Denise Mungle of St. Charles, Missouri. They have three daughters. He enjoys golf and flying light aircraft. He flies a Varieze, an experimental aircraft that he built. His parents, Charles and Helen Precourt, reside in Hudson. Her parents, Loyd and Jerry Mungle, reside in Streetman, Texas.

EDUCATION - Graduated from Hudson High School, Hudson, Massachusetts, in 1973; received a bachelor of science degree in aeronautical engineering from the United States Air Force Academy in 1977, a master of science degree in engineering management from Golden Gate University in 1988, and a master of arts degree in national security affairs and strategic studies from the United States Naval War College in 1990. While at the United States Air Force Academy, Precourt also attended the French Air Force Academy in 1976 as part of an exchange program.

ORGANIZATIONS - Member of the Association of Space Explorers, the Society of Experimental Test Pilots (SETP), the Soaring Society of America, and the Experimental Aircraft Association.

SPECIAL HONORS - Awarded the Defense Superior Service Medal (2), and the Air Force Meritorious Service Medal (2). Precourt is a distinguished graduate of the United States Air Force Academy and the United States Naval War College. In 1978 he was the Air Training Command Trophy Winner as the outstanding graduate of his pilot training class. In 1989 he was recipient of the David B. Barnes Award as the Outstanding Instructor Pilot at the United States Air ForceTest Pilot School.

EXPERIENCE - Precourt graduated from Undergraduate Pilot Training at Reese Air Force Base, Texas, in 1978. Initially he flew as an instructor pilot in the T-37, and later as a maintenance test pilot in the T-37 and T-38 aircraft. From 1982 through 1984, he flew an operational tour in the F-15 Eagle at Bitburg Air Base in Germany. In 1985 he attended the United States Air Force Test Pilot School at Edwards Air Force Base in California. Upon graduation, Precourt was assigned as a test pilot at Edwards, where he flew the F-15E, F-4, A-7, and A-37 aircraft until mid 1989, when he began studies at the United States Naval War College in Newport, Rhode Island. Upon graduation from the War College, Precourt joined the astronaut program. His flight experience includes over 5,500 hours in over 50 types of civil and military aircraft. He holds commercial pilot, multi-engine instrument, glider and certified flight instructor ratings.

NASA EXPERIENCE - Selected by NASA in January 1990, Precourt became an astronaut in July 1991. His technical assignments to date have included: Manager of ascent, entry, and launch abort issues for the Astronaut Office Operations Development Branch; spacecraft communicator (CAPCOM), providing the voice link from the Mission Control Center during launch and entry for several Space Shuttle missions; Director of Operations for NASA at the Gagarin Cosmonaut Training Center in Star City, Russia, from October 1995 to April 1996, with responsibility for the coordination and implementation of mission operations activities in the Moscow region for the joint U.S./Russian Shuttle/Mir program. A veteran of two space flights, STS-55 in 1993 and STS-71 in 1995, Precourt has logged over 475 hours in space.

Precourt flew his first space mission as a mission specialist aboard Columbia on STS-55, which launched from Kennedy Space Center, Florida, on April 26, 1993. Nearly 90 experiments were conducted during this German-sponsored Spacelab D-2 mission to investigate life sciences, materials sciences, physics, robotics, astronomy and the Earth and its atmosphere. STS-55 also flew the Shuttle Amateur Radio Experiment (SAREX) making contact with students in 14 schools around the world. After 160 orbits of the earth in 240 flight hours, the 10-day mission concluded with a landing on Runway 22 at Edwards Air Force Base, California, on May 6, 1993.

Most recently, (June 27 to July 7, 1995), Precourt was the pilot on the seven-member crew (up) and eight-member crew (down) of Space Shuttle mission STS-71. This was the first Space Shuttle mission to dock with the Russian Space Station Mir, and involved an exchange of crews. The Atlantis Space Shuttle was modified to carry a docking system compatible with the Russian Mir Space Station. It also carried a Spacelab module in the payload bay in which the crew performed various life sciences experiments and data collections. Mission duration was 235 hours, 23 minutes.

CURRENT ASSIGNMENT - Precourt will command STS-84, NASA's sixth Shuttle mission to rendezvous and dock with the Russian Space Station Mir. Launch is scheduled for May 1997.

EILEEN MARIE COLLINS (Lieutenant Colonel, USAF)
STS-84 Pilot

PERSONAL DATA - Born November 19, 1956, in Elmira, New York. Married to Pat Youngs, originally from San Antonio, Texas. They have one child. She enjoys running, golf, hiking, camping, reading, photography, astronomy. Her parents, James and Rose Marie Collins, reside in Elmira, New York. His parents, Pat and Jackie Youngs, reside in San Antonio.

EDUCATION - Graduated from Elmira Free Academy, Elmira, New York, in 1974; received an associate in science degree in mathematics/science from Corning Community College in 1976; a bachelor of arts degree in mathematics and economics from Syracuse University in 1978; a master of science degree in operations research from Stanford University in 1986; and a master of arts degree in space systems management from Webster University in 1989.

ORGANIZATIONS - Member of the Air Force Association, Order of Daedalians, Women Military Aviators, U.S. Space Foundation, the American Institute of Aeronautics and Astronautics, and the Ninety-Nines.

SPECIAL HONORS - Awarded the Defense Superior Service Medal, the Air Force Meritorious Service Medal with one oak leaf cluster, the Air Force Commendation Medal with one oak leaf cluster, the Armed Forces Expeditionary Medal for service in Grenada (Operation Urgent Fury, October 1983), and the NASA Space Flight Medal.

EXPERIENCE - Collins graduated in 1979 from Air Force Undergraduate Pilot Training at Vance AFB, Oklahoma, where she was a T-38 instructor pilot until 1982. From 1983 to 1985, she was a C-141 aircraft commander and instructor pilot at Travis AFB, California. She spent the following year as a student with the Air Force Institute of Technology. From 1986 to 1989, she was assigned to the U.S. Air Force Academy in Colorado, where she was an assistant professor in mathematics and a T-41 instructor pilot. She was selected for the astronaut program while attending the Air Force Test Pilot School at Edwards AFB, California, from which she graduated in 1990.

She has logged over 4,700 hours in 30 different types of aircraft.

Selected by NASA in January 1990, Collins became an astronaut in July 1991. Initially assigned to Orbiter engineering support, she also served on the astronaut support team responsible for Orbiter prelaunch checkout, final launch configuration, crew ingress/egress, and landing/recovery. From April 1995 to October 1996, she worked in Mission Control as a spacecraft communicator (CAPCOM). Currently, she is training for STS-84, the sixth Space Shuttle docking mission with the Russian Space Station Mir. Launch is scheduled for May 1997.

In February 1995, Collins served as pilot on STS-63, the first flight of the new joint Russian-American Space Program. Mission highlights included the rendezvous with the Russian Space Station, Mir, operation of Spacehab, the deployment and retrieval of an astronomy satellite, and a spacewalk. Collins' first mission was accomplished in 129 orbits, traveling over 2.9 million miles in 198 hours, 29 minutes. She was the first woman pilot of a Space Shuttle.

C. MICHAEL1 FOALE (Ph.D.)
STS-84 Mission Specialist

PERSONAL DATA - Born January 6, 1957, in Louth, England, but considers Cambridge, England, to be his hometown. Married to the former Rhonda R. Butler of Louisville, Kentucky. They have two children. He enjoys many outdoor activities, particularly wind surfing. Private flying, soaring, and project scuba diving have been his other major sporting interests. He also enjoys exploring theoretical physics and writing children's software on a personal computer. His parents, Colin and Mary Foale, reside in Cambridge, England. Her parents, Reed & Dorothy Butler, reside in Louisville, Kentucky.

EDUCATION - Graduated from Kings School, Canterbury, in 1975. He attended the University of Cambridge, Queens' College, receiving a bachelor of arts degree in Physics, National Sciences Tripos, with 1st class honors, in 1978. While at Queens' College, he completed his doctorate in Laboratory Astrophysics at Cambridge University in 1982.

ORGANIZATIONS - Member of the Cambridge Philosophical Society, England, and Aircraft Owners & Pilots Association.

EXPERIENCE - While a postgraduate at Cambridge University, Foale participated in the organization and execution of scientific scuba diving projects. With the cooperation of the Greek government, he participated as both a member of one expedition and the leader of another, surveying underwater antiquities in Greece. In the fall of 1981, he dove on the 1543 ocean galleon, "The Mary Rose," as a volunteer diver, learning excavation and survey techniques in very low visibility conditions. Pursuing a career in the U.S. Space Program, Foale moved to Houston, Texas, to work on Space Shuttle navigation problems at McDonnell Douglas Aircraft Corporation. In June 1983, Foale joined NASA Johnson Space Center in the payload operations area of the Mission Operations Directorate. In his capacity as payload officer in the Mission Control Center, he was responsible for payload operations on Space Shuttle missions STS-51G, 51-I, 61-B and 61-C.

NASA EXPERIENCE - Selected as an astronaut candidate by NASA in June 1987, Foale completed a one-year training and evaluation program in August 1988. Before his first flight he flew the Shuttle Avionics Integration Laboratory (SAIL) simulator to provide verification and testing of the Shuttle flight software, and later developed crew rescue and integrated operations for International Space Station Alpha. He has served as Deputy Chief of the Mission Development Branch in the Astronaut Office, and Head of the Astronaut Office Science Support Group. He is presently training at the Cosmonaut Training Center, Star City, Russia, in preparation for a long duration flight on the Russian Space Station Mir. Launch is scheduled on STS-84 in May 1997. A veteran of three space flights, he has logged more than 634 hours in space. He flew as a mission specialist on STS-45 (March 24 to April 2, 1992) the first of the ATLAS series of missions to address the atmosphere and its interaction with the Sun, and again as a mission specialist on STS-56, carrying ATLAS-2, and the SPARTAN retrievable satellite which made observations of the solar corona.

Most recently, he served as a mission specialist on STS-63 (February 2-11, 1995), the first rendezvous with the Russian Space Station, Mir. During the flight he made a space walk (extravehicular activity) for 4 hours, 39 minutes, evaluating the effects of extremely cold conditions on his spacesuit, as well as moving the 2800-pound Spartan satellite as part of a mass handling experiment.

CARLOS I. NORIEGA (Major, USMC)
STS-84 Mission Specialist

PERSONAL DATA - Born October 8, 1959, in Lima, Peru. Considers Santa Clara, California, to be his hometown. Married to the former Wendy L. Thatcher. They have five children. He enjoys flying, running, snow skiing, racquetball, and chasing after his small children. His parents, Rodolfo and Nora Noriega, reside in Gilbert, Arizona. Her parents, John and Elizabeth Thatcher, reside in Honolulu, Hawaii.

EDUCATION - Graduated from Wilcox High School, Santa Clara, California, in 1977. Bachelor of science degree in computer science from University of Southern California, 1981. Master of science degree in computer science from the Naval Postgraduate School, 1990. Master of science degree in space systems operations from the Naval Postgraduate School, 1990.

ORGANIZATIONS - American Institute of Aeronautics and Astronautics.

SPECIAL HONORS - Defense Meritorious Service Medal, Air Medal with Combat Distinguishing Device, Air Medal (Strike Flight Award), Navy Achievement Medal.

EXPERIENCE - Noriega was a member of the Navy ROTC unit and received his commission in the United States Marine Corps at the University of Southern California in 1981. Following graduation from flight school, he flew CH-46 Sea Knight helicopters with HMM-165 from 1983 to 1985 at Marine Corps Air Station (MCAS) Kaneohe Bay, Hawaii. Noriega made two 6-month shipboard deployments in the West Pacific/Indian Ocean including operations in support of the Multi-National Peacekeeping Force in Beirut, Lebanon. He completed his tour in Hawaii as the Base Operations Officer for Marine Air Base Squadron 24. In 1986 he was transferred to MCAS Tustin, California, where he served as the aviation safety officer and instructor pilot with HMT-301. In 1988, Noriega was selected to attend the Naval Postgraduate School in Monterey, California, where he earned two master of science degrees. Upon graduation in September 1990, he was assigned to United States Space Command in Colorado Springs, Colorado. In addition to serving as a Space Surveillance Center Commander, he was responsible for the acquisition of several software development projects and was ultimately the command representative for the development and integration of the major space and missile warning computer system upgrades for Cheyenne Mountain Air Force Base. At the time of his selection, he was serving on the staff of the 1st Marine Aircraft Wing in Okinawa, Japan.

He has logged approximately 2,000 flight hours in various fixed wing and rotary wing aircraft.

NASA EXPERIENCE - Selected by NASA in December 1994, Noriega reported to the Johnson Space Center in March 1995, has completed a year of training and evaluation, and is currently qualified for assignment as a mission specialist. He was initially assigned to work technical issues for the Astronaut Office EVA/Robotics Branch while awaiting his first flight assignment.

CURRENT ASSIGNMENT - Noriega will serve as a mission specialist on STS-84, NASA's sixth Shuttle mission to rendezvous and dock with the Russian Space Station Mir. Launch is scheduled for May 1997.

EDWARD TSANG LU (Ph.D.)
STS-84 Mission Specialist

PERSONAL DATA - Born July 1, 1963, in Springfield, Massachusetts. Considers Honolulu, Hawaii, and Webster, New York, to be his hometowns. Unmarried. He enjoys aerobatic flying, coaching wrestling, piano, tennis, surfing, skiing, travel. His parents, Charlie and Snowlily Lu, reside in Fremont, California.

EDUCATION - Graduated from R.L. Thomas High School, Webster, New York, in 1980. Bachelor of science degree in electrical engineering from Cornell University, 1984. Doctorate in applied physics from Stanford University, 1989.

ORGANIZATIONS - American Astronomical Society, Aircraft Owners and Pilots Association.

SPECIAL HONORS - Cornell University Presidential Scholar, Hughes Aircraft Company Masters Fellow.

EXPERIENCE - Since obtaining his Ph.D., Dr. Lu has been a research physicist working in the fields of solar physics and astrophysics. He was a visiting scientist at the High Altitude Observatory in Boulder, Colorado, from 1989 until 1992, the final year holding a joint appointment with the Joint Institute for Laboratory Astrophysics at the University of Colorado. From 1992 until 1995, he was a postdoctoral fellow at the Institute for Astronomy in Honolulu, Hawaii. Dr. Lu has developed a number of new theoretical advances which have provided for the first time a basic understanding of the underlying physics of solar flares. He has published articles on a wide range of topics including solar flares, cosmology, solar oscillations, statistical mechanics, and plasma physics. He has given over 20 invited lectures at various universities and international conferences. He holds a commercial pilot certificate with instrument and multi-engine ratings.

NASA EXPERIENCE - Selected by NASA in December 1994, Dr. Lu reported to the Johnson Space Center in March 1995, has completed a year of training and evaluation, and is qualified for assignment as a mission specialist. He was initially assigned to work technical issues in the Computer Support Branch of the Astronaut Office.

CURRENT ASSIGNMENT - Dr. Lu will serve as a mission specialist on STS-84, NASA's sixth Shuttle mission to rendezvous and dock with the Russian Space Station Mir. Launch is scheduled for May 1997.

JEAN-FRANCOIS CLERVOY
STS-84 Mission Specialist

PERSONAL DATA - Born November 19, 1958, in Longeville-les-Metz, France, but considers Toulouse, France, to be his hometown. Married to the former Laurence Boulanger. They have two children. He enjoys racquet sports, skill games, canyoning, skiing, and flying activities such as boomerang, frisbee, kites. His father, Jean Clervoy (French Air Force, Ret.), and his mother, Mireille Clervoy, reside in Franconville, France. Her parents, Robert and Juliette Boulanger, reside in Le Perreux-sur-Marne, France.

EDUCATION - Received his baccalauréat from Collège Militaire de Saint Cyr l' Ecole in 1976; passed Math. Sup. and Math. Spé. M' at Prytanée Militaire, La Flèche in 1978. Graduated from Ecole Polytechnique, Paris, in 1981; graduated from Ecole Nationale Supérieure de l' Aéronautique et de l' Espace, Toulouse, in 1983; graduated as a Flight Test Engineer from Ecole du Personnel Navigant d' Essais et de Réception, Istres, in 1987.

ORGANIZATIONS - Member, Association of Space Explorers. Honorary member of the French Aeronautics and Astronautics Association.

SPECIAL HONORS - NASA Space Flight Medal. Chevalier de l' Ordre National du Mérite. Chevalier de l' Ordre National de la Légion d' Honneur. Komarov Diploma.

EXPERIENCE - Clervoy was seconded from the Délégation Générale pour L' Armement (DGA) to CNES (French Space Agency) in 1983, where he worked on automatics and attitude control systems for several satellite projects. He was selected in the second group of French astronauts in 1985. Subsequently he participated in an intensive Russian language course.

After graduating as a flight test engineer in 1987, he spent the next five years part-time at the Flight Test Center, Brétigny-sur-Orge, as Chief Test Director of the Parabolic Flight Program, responsible for testing and qualifying the Caravelle aircraft for microgravity, and part-time at the Hermes Crew Office, Toulouse, where he supported the European Manned Space Programs in the fields of extravehicular activity, rendezvous and docking, robotic arm, and man machine interface. In 1991, he trained in Star City, Moscow, on the Soyuz and Mir systems. In 1992, he was selected to join the astronaut corps of the European Space Agency (ESA). He holds military and civilian parachuting licenses, military and civilian diving licenses, and private pilot license. From 1983 to 1987, Clervoy was also a lecturer in signal processing and general mechanics at the Ecole Nationale Supérieure de l'Aéronautique et de l' Espace, Toulouse. Jean-François holds a commission as Ingénieur en Chef de l' Armement in the DGA.

NASA EXPERIENCE - Clervoy reported to the Johnson Space Center in August 1992. Following one year of training he qualified as a mission specialist for Space Shuttle flights. Clervoy was initially assigned to work robotics issues for the Astronaut Office Mission Development Branch.

After his first space mission he was assigned as flight software verification lead in the Shuttle Avionics Integration Laboratory (SAIL) for the Astronaut Office Mission Support Branch, and was responsible for designing the robotics displays for the Space Station Branch.

Clervoy served as a mission specialist aboard Space Shuttle Atlantis on the STS-66 Atmospheric Laboratory for Applications and Science-3 mission (November 3-14, 1994). ATLAS-3 was part of an ongoing program to determine the Earth's energy balance and atmospheric change over an 11-year solar cycle. Clervoy used the robotic arm to deploy the CRISTA-SPAS atmospheric research satellite 20 hours after lift-off. Clervoy logged 262 hours and 34 minutes in space and 175 orbits of the Earth.

CURRENT ASSIGNMENT - Clervoy will serve as a Payload Commander on STS-84, NASA's sixth scheduled Shuttle mission to rendezvous and dock with the Russian Space Station Mir. Launch is scheduled for May 1997.

ELENA V. KONDAKOVA
RSA Cosmonaut
STS-84 Mission Specialist

PERSONAL DATA - Born March 30, 1957, in Mitischi, Moscow Region. Married to Ryumin Valerii V., born 1939 in Komsomolskna-Amure, Kharbarovsk Region, Russia. They have one child. Kondakova enjoys the theater, river fishing, reading, traveling. Her parents, Kondakov Vladimir A. and Kondakova (Morozova) Klavdiya S. reside in Kaliningrad, Moscow Region. His parents, Ryumin Viktor N. and Ryumina (Podporina) Alexandra F., are deceased.

EDUCATION - Graduated from Moscow Bauman High Technical College in 1980.

SPECIAL HONORS - Hero of Russia.

EXPERIENCE - Upon graduation, in 1980, Kondakova started to work in RSC-Energia completing science projects, experiments and research work. Then in 1989 she was selected as a cosmonaut candidate by RSC-Energia Main Design Bureau and sent to Gagarin Cosmonaut Training Center to start the course of general space training. After finishing the course in March, 1990, Kondakova was qualified as "test cosmonaut". From January through June of 1994, she was under training for the 17th main mission and "Euromir-94" flight as a flight engineer of the prime crew. October 4, 1994 through March 9, 1995, she fulfilled her first flight onboard the spacecraft "Soyuz TM-17" and the orbital complex "Mir" as a flight engineer of the 17th main mission. She has spent 169 days in space, including 5 days with NASA Astronaut Norman Thagard. The program included a month long joint flight with German Astronaut Ulf Merbold.

NASA EXPERIENCE - Elena Kondakova will serve as a mission specialist on STS-84, NASA's sixth scheduled Shuttle mission to rendezvous and dock with the Russian Space Station Mir. Launch is scheduled for May 1997.

JERRY M. LINENGER, M.D., (Captain, Medical Corps, USN)
Mir 22 & 23 Flight Engineer-2
STS-84 Mission Specialist

PERSONAL DATA - Born January 16, 1955, and raised in Eastpointe, Michigan. Married to the former Kathryn M. Bartmann of Arlington Heights, Illinois. They have one son. He enjoys competitive triathalons, ocean swim racing, marathons, downhill and cross-country skiing, scuba diving, backpacking, camping. Siblings include Kenneth Linenger, Susan Barry, Karen Brandenburg, and Barbara Vallone, all residing in Michigan. His mother, Frances J. Linenger, resides in Eastpointe, Michigan. His father, Donald W. Linenger, is deceased.

EDUCATION - Graduated from East Detroit High School, Eastpointe, Michigan, in 1973; received a bachelor of science degree in bioscience from the U.S. Naval Academy in 1977; a doctorate in medicine from Wayne State University in 1981; a master of science degree in systems management from University of Southern California in 1988; a master of public health degree in health policy from the University of North Carolina in 1989; a doctor of philosophy degree in epidemiology from the University of North Carolina in 1989.

ORGANIZATIONS - The U.S. Naval Academy, University of Southern California, Wayne State University School of Medicine, and University of North Carolina Alumni Associations; the Association of Naval Aviation; the U. S. Navy Flight Surgeons Association; the Aerospace Medicine Association; the American Medical Association; the American College of Preventive Medicine; the Society of U.S. Navy Preventive Medicine Officers; and the American College of Sports Medicine. Linenger is board certified in preventive medicine.

SPECIAL HONORS - Awarded the Meritorious Unit Commendation; Navy Unit Commendation; National Defense Service Medal; Navy Battle Efficiency Award; Navy Commendation Medal with gold star; and NASA Space Flight Medal. Top graduate, Naval Flight Surgeon Training and Naval Safety Officer's School. Elected to Phi Kappa Phi and Alpha Omega Alpha academic honor societies. Distinguished Alumni Award, Wayne State University School of Medicine.

EXPERIENCE - Linenger graduated from the U.S. Naval Academy and proceeded directly to medical school. After completing surgical internship training at Balboa Naval Hospital, San Diego, California, and aerospace medicine training at the Naval Aerospace Medical Institute, Pensacola, Florida, he served as a naval flight surgeon at Cubi Point, Republic of the Philippines. He was then assigned as medical advisor to the Commander, Naval Air Forces, U.S. Pacific Fleet, San Diego. After completing doctorate-level training in epidemiology, Linenger returned to San Diego as a research principal investigator at the Naval Health Research Center. He concurrently served as a faculty member at the University of California-San Diego School of Medicine in the Division of Sports Medicine.

NASA EXPERIENCE - Linenger joined astronaut selection Group XIV at the Johnson Space Center in August 1992. Linenger flew on STS-64 (September 9-20, 1994) aboard the Space Shuttle Discovery. Mission highlights included: first use of lasers for environmental research; deployment and retrieval of a solar science satellite; robotic processing of semiconductors; use of an RMS-attached boom for jet thruster research; first untethered spacewalk in 10 years to test a self-rescue jetpack. In completing his first mission, Linenger has logged 10 days, 22 hours, 51 minutes in space, completed 177 orbits, and traveled over 4.5 million miles. He trained at the Cosmonaut Training Center in Star City, Russia, in preparation for a 5 month stay in space aboard the Russian Space Station Mir. He launched aboard STS-81 on January 12, 1997 and will return aboard STS-84 in May 1997.

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Debra Rahn / Michael Braukus
Headquarters, Washington, DC
(Phone: 202/358-1639)

May 1, 1997

Ed Campion / Kyle Herring
Johnson Space Center, Houston, TX
(Phone: 281/483-5111)

Lisa Malone / Bruce Buckingham
Kennedy Space Center, FL
(Phone: 407/867-2468)

NOTE TO EDITORS: N97-31

MAY 15 SELECTED FOR SIXTH SHUTTLE-MIR MISSION LAUNCH

NASA managers today set May 15 as the official launch date for Space Shuttle Atlantis' sixth docking with Russia's Space Station Mir following completion of the Flight Readiness Review at the Kennedy Space Center (KSC), FL.

The STS-84 launch window opens at about 4:08 a.m. EDT and extends for approximately seven minutes. The actual opening of the window may vary by a couple of minutes based on the Shuttle's rendezvous requirements and Mir's precise location in space at the time of launch. An on-time launch May 15 will result in Atlantis landing at about 7:49 a.m. EDT, Saturday, May 24, at KSC, completing nine days in space.

"We have just completed a comprehensive review of the STS-84 mission," said Johnson Space Center Director George Abbey, who chaired the meeting. "Together with our Russian partners, we reviewed the status of Atlantis and the Mir station and have agreed that everything is ready to proceed with the next docking mission. We look forward to welcoming Jerry Linenger home after his stay on Mir and also look forward to watching Mike Foale continue our cooperative efforts and joint science experiments on the station."

STS-84 is the sixth in a series of docking missions between the Shuttle and Mir and the third involving the exchange of American astronauts. Linenger, who has been a Mir crew member since January 15, will be replaced by Foale, who then will spend more than four months on the station before returning to Earth on the STS-86 Atlantis/Mir docking mission in September.

-end-

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(202) 358-1600

For Release

Michael Braukus
Headquarters, Washington, DC
(Phone: 202/358-1979)

May 1, 1997

Steve Roy
Marshall Space Flight Center, Huntsville, AL
(Phone: 205/544-0034)

RELEASE: 97-86

NASA AWARDS 36 MICROGRAVITY RESEARCH GRANTS

NASA has selected 36 researchers from 19 states and the District of Columbia to receive four-year grants worth $2.8 million for microgravity biotechnology research.

This ground-based research will continue to build the foundation for research on the Space Shuttle and International Space Station.

Sponsored by NASA's Human Exploration and Development of Space Enterprise, through the Office of Life and Microgravity Science and Applications in Washington, DC, and managed by the Microgravity Research Program at the Marshall Space Flight Center in Huntsville, AL, this research is aimed at improving the understanding of physical and chemical processes in the areas of protein crystal growth, cell science and fundamental biotechnology.

This selection adds to the 49 researchers already associated with the program managed by Marshall. Involved in microgravity biotechnology research since the early 1970s, Marshall administers the national microgravity biotechnology effort, providing the scientific, technical and management expertise to successfully conduct spaceflight research.

Ronald F. Porter, manager of NASA's Biotechnology Program at Marshall, said "Researchers selected for funding will have NASA's microgravity research facilities -- drop-tubes, drop-towers, and aircraft flying parabolic trajectories -- at their disposal. Their work may eventually lead to flight experiments in space."

-more-

A number of the studies involve cellular growth, a key field that is fundamental to medical science. To support cell science, researchers can simulate the microgravity conditions of space in NASA's bioreactor, using rotation to suspend cell cultures in a growth medium. This technique -- successfully used to study cancer growth -- improves our ability to grow cells and tissues outside the human body. Some researchers believe the best environment for growing cells is in space, where the lack of gravitational effects makes it easier to maintain a suspension of growing cells. NASA's Johnson Space Center, Houston, TX, leads the support of cellular growth studies for Marshall.

Protein crystal growth research supported by NASA has important applications in medicine, drug design and agriculture. Proteins are complex biochemicals that serve a variety of purposes in living organisms. Crystallized proteins allow scientists to learn the molecular structure of proteins. Determining that structure will lead to a greater understanding of how organisms function. Knowledge of the structure also helps the pharmaceutical industry develop disease-fighting drugs.

NASA received 130 proposals in response to its microgravity biotechnology research announcement. These proposals were reviewed by scientific and technical experts outside NASA, including reviewers associated with the National Institutes of Health.

- end -

Editor's Note: A list of the grant recipients is available on the World Wide Web at URL:

ftp://ftp.hq.nasa.gov/pub/pao/pressrel/1997/97-086a.txt

or to media representatives by calling the NASA Newsroom at 202/358-1600.

News Release

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Space Administration
Washington, DC 20546
(202) 358-1600

For Release

Jim Cast
Headquarters, Washington, DC
(Phone: 202/358-1779)

May 2, 1997

John Bluck
Ames Research Center, Mountain View, CA
(Phone: 415/604-5026)

Lori Rachul
Lewis Research Center, Cleveland, OH
(Phone: 216/433-8806)

Ann Gaudreaux
Langley Research Center, Hampton, VA
(Phone: 757/864-8150)

John Watson
Jet Propulsion Laboratory, Pasadena, CA
(Phone: 818/354-0474)

RELEASE: 97-87

NASA SENDS HIGH TECH INVENTIONS TO ANAHEIM CONFERENCE

NASA will showcase some of its most promising technologies which could lead to revolutionary products at the 42nd International Society for the Advancement of Material and Process Engineering Symposium/Exhibition May 5-8, in the Anaheim Convention Center, Anaheim, CA.

"NASA is driving cutting-edge technologies, and we're redoubling our efforts to get those technologies into industry's hands," said Michael Weingarten, NASA's manager for business development, NASA Headquarters, Washington, DC. "Our goal is to bring space technology down to Earth so U.S. companies can access new developments and improve U.S. competitive strength," he added.

NASA invests more than $5 billion in technology development annually, he said. "It makes sense to bring that cutting-edge technology back to U.S. taxpayers when such a huge investment is being made," he stated. "Companies can work with NASA or with licensed NASA technicians in efforts that will lead to new company products. We can explore the best way to partner depending on each client's needs," he explained.

Attendees can enter a contest for a tour of Space Shuttle facilities at NASA's Kennedy Space Center, FL.

-more-

A system to treat wastes from metal plating, semi-conductor production, photographic laboratories, food processing and aircraft de-icing operations is one technology to be presented at the symposium by NASA's Ames Research Center, Mountain View, CA. The system also can be used for seawater and brackish water desalination.

Additional technologies developed at three other NASA Centers also are slated for presentation at the symposium.

From NASA's Jet Propulsion Laboratory, Pasadena, CA:

- Manufacture of carbon/carbon composite materials. Some potential uses include aircraft and automobile brakes and heat dissipation for electronics.
- Energy-efficient microwave processing of materials. Possible uses of the process are ceramic/ceramic and ceramic/metal joining and semiconductor wafer annealing.
- Ultrasound non-destructive evaluation for composite materials. This system can be used to measure material thickness, stiffness, quality, integrity, porosity and resin content.

From NASA's Langley Research Center, Hampton, VA:

- Next generation molded magnets. These magnets, made with metallic particles and a polymer developed at Langley, could be used in transformers, motors and other equipment.
- Yarn density sensor. This optical sensor is used to determine the mass and density of textile yarn during manufacture.
- Non-toxic polyimide. Potential uses are to make composite materials for aircraft, automobile engine parts, circuit boards, adhesives, foams, resin-molded hardware and thin films.

From NASA's Lewis Research Center, Cleveland, OH:

- Design and analysis of composite materials and structures. This technology could be used for aerospace and automotive components, biomedical devices, civil structures, construction materials, heat exchangers, pressure vessels and piping, sporting goods, offshore drilling structures, transportation components, electronics and utility structures.
- Ceramics Analysis and Reliability Evaluation of Structures integrated design software. Potential uses are aerospace, automotive, propulsion and power, bioengineering and glass applications.
- Affordable silicon, carbide-based ceramics and fiber-reinforced composites. Uses under consideration are for hot sections of jet engines, nose cones, radiant heater tubes, heat exchangers, ceramic burner inserts and other applications.
- Advanced metallics. Commercial uses anticipated include: (Copper-chromium-niobium alloys) electrodes, welding, brazing, electrical, plastics and metal castings; (nickel aluminide) die cast and glass-making molds and many other uses.
- High-temperature polymer matrix composites. Potential uses include ductwork for jet engines and automotive engines and exhaust system parts, among other applications.
- Advanced diamond coatings. One possible use is for barriers for gears and bearings.

Previous technology spin-off success stories include how composite materials developed for the Space Shuttle are being used to improve golf clubs, how aircraft wing and body research led to use of liquid crystals in watches and thermometers, and how material developed for space suits now covers stadiums and airport terminals.

-end-

News Release

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release

Sarah Keegan
Headquarters, Washington, DC
(Phone: 202/358-1600)

May 2, 1997

James Sahli
Goddard Space Flight Center, Greenbelt, MD
(Phone: 301/286-0697)

RELEASE: 97-88

GODDARD SCIENTIST SELECTED FOR NATIONAL ACADEMY OF SCIENCES

Dr. John C. Mather, a senior astrophysicist at NASA's Goddard Space Flight Center, Greenbelt, MD, has been elected to the National Academy of Sciences (NAS) for his distinguished and continuing achievements in original research.

Mather joins 74 new NAS members and associates who were elected this week. Election to membership in the Academy is considered one of the highest honors that can be accorded a U.S. scientist or engineer.

Mather was selected for his work as project scientist for NASA's Cosmic Background Explorer (COBE) spacecraft. Dr. Mather currently is study scientist for NASA's Next Generation Space Telescope and is a senior fellow in Goddard's Space Science Directorate.

Mather led the first proposal for the COBE satellite in 1974 and became its project scientist and one of the three principal investigators. COBE was launched in 1989 and measured and mapped the microwave and infrared sky with unprecedented precision.

In 1992, the COBE team announced it had mapped the primordial hot and cold spots in the cosmic microwave background radiation. These spots are related to the gravitational field in the early universe, only instants after the Big Bang, and are the seeds for the giant clusters of galaxies that stretch hundreds of millions of light years across the universe. The team also showed that the Big Bang radiation has a spectrum agreeing exactly with the theoretical prediction, confirming the Big Bang theory and showing that the Big Bang was complete in instants, with only a tiny fraction of the energy released later.

-more-

When asked how the team could do such a remarkable thing, Dr. Mather said, "It was an incredibly challenging team project. We attempted something that seemed impossible, and it nearly was. It was only by tremendous effort and constant testing that we could do it at all. It seemed that everything that could go wrong did go wrong, but we fixed it, and it worked. The real credit should go to the whole team. We had to rebuild the whole satellite after the Challenger accident, and we did it in just over two years."

Mather attended Newton High School in New Jersey and grew up living on the Rutgers University Dairy Research Station near Sussex, where his father worked. He received a bachelor of arts degree in Physics with highest honors from Swarthmore College (near Philadelphia) in 1968. He received his doctorate in Physics in 1974 from the University of California at Berkeley.

Other scientific positions he has held include: Head of the Infrared Astrophysics Branch at Goddard from 1988-89, and 1990-93; and Chairperson, Board of External Advisors, Center for Astrophysical Research in Antarctic, at Yerkes Observatory in Williams Bay, WI, from 1992-1994.

Mather has received six non-NASA awards and honors since graduate school and published more than 50 technical articles on his research. He published a book on the COBE project, titled, "That Very First Light," in 1996.

Mather and his wife, the former Jane Hauser of New York City, live in Hyattsville, MD. His father, Dr. Robert Mather, was a geneticist and his mother, Martha Mather, was an elementary school teacher. They both are retired and live in East Brunswick, NJ. His sister, Janet Mather, lives in the Chesnut Hill neighborhood of Philadelphia.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Donald Savage
Headquarters, Washington, DC
(Phone: 202/358-1547)

May 5, 1997

William Steigerwald
Goddard Space Flight Center, Greenbelt, MD
(Phone: 301/286-1085)

RELEASE: 97-89

SPACECRAFT WATCH FOR COMET HALE-BOPP TAIL DISRUPTION

A fleet of spacecraft for the International Solar Terrestrial Physics (ISTP) program is watching for a break in Comet Hale-Bopp's plasma ion tail.

"Preliminary estimates indicate that it may happen in the next few days," said Dr. Mario Acuna, lead scientist for ISTP at NASA's Goddard Space Flight Center (GSFC), Greenbelt, MD. Goddard is the focal point for many of the ISTP investigations.

Amateur astronomers around the world were put on watch last week when Dr. Bill Farrell, co-investigator for NASA's Wind spacecraft at GSFC, placed a notice on an Internet E-mail list, after scientists studying data from ISTP spacecraft estimated that Comet Hale-Bopp's ion tail likely would be disrupted when it enters a region around the Sun known as the "current sheet." Observations from amateur astronomers monitoring changes in the comet's tails will provide near-real-time data to scientists to complement observations from spacecraft.

Scientists explain the disruption as a complicated interaction between the comet and the Sun's influence and magnetic fields. As a comet comes closer to the Sun, ices from the nucleus (a porous structure of dust and ice composed of frozen gases) are continually vaporized, dislodging the dust, which is formed by the comet's weak gravity into a cloud, called a coma, surrounding the comet. While pressure from the visible sunlight "pushes" the coma dust into a diffuse dust tail, the ultraviolet portion of the sunlight gives the coma an electrical charge, or ionizes it, turning it into a plasma of electrically charged particles of ions and electrons.

-more-

The solar wind (also a plasma), flowing from the Sun at speeds from 240-450 miles per second and carrying an embedded magnetic field, smashes into the coma gas, causing additional ionization. The magnetic field in the solar wind picks up comet ions and accelerates them into a long, blue plasma tail. Since this tail is stretched very long, it is much fainter than the dust tail and consists mostly of long-lived (stable) ionized carbon monoxide. The magnetic field is draped around the comet coma and controls the formation of the plasma tail. If the magnetic field is disrupted, the plasma tail may be disconnected.

Hale-Bopp's orbit is tilted relative to the Sun's equator with the comet moving from the Sun's northern hemisphere to its southern hemisphere, crossing the Sun's equatorial plane. This plane is the location of the "current sheet," a place where the Sun's magnetic field lines change direction. As Hale-Bopp passes through this plane, its ion tail may disconnect because of the change in direction of the magnetic field.

"Other events on the Sun may disrupt Hale-Bopp's tail," adds Dr. Farrell. "For example, at any time, the Sun may eject large amounts of hot, electrically charged material in the form of plasma, called Coronal Mass Ejections, or CME's. The magnetic fields associated with a CME may disrupt the ion tail, particularly if the CME is from the Sun's eastern limb in the direction of Hale-Bopp. Also, the solar wind is more gusty around the equatorial regions, and this could cause a disruption as well," he said.

"Monitoring this comet tail disruption is more than anticipating an intriguing astronomical phenomenon," said Dr. Farrell. "The stronger solar events can have a tremendous impact on Earth. The plasma ejected by these events smashes into the Earth's magnetic field and compresses it. This generates a magnetic storm which can disrupt power grids and radio communications. Additionally, the effects can damage microcircuits in satellites. With ISTP, if we can monitor disruption events for comets, we can do the same for Earth, providing a warning when they occur," he said.

When Hale-Bopp crosses the current sheet, it will provide additional data about its structure where no ISTP spacecraft exist. "It could cost about a billion dollars to build and place a spacecraft where Hale-Bopp is," said Dr. Adam Szabo, senior scientist with Hughes STX on the Wind project. "Comet Hale-Bopp will give us interesting information about this region of space for virtually no cost, except our time to watch and study it. It's a bonus which can really help us understand the most powerful forces which are affecting the Earth."

The ISTP spacecraft involved in this study are NASA's Polar and Wind missions and the European Space Agency/NASA Solar and Heliospheric Observatory mission.

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News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

Donald Savage
Headquarters, Washington, DC
(Phone: 202/358-1547)

Tammy Jones
Goddard Space Flight Center, Greenbelt, MD
(Phone: 301/286-5566)

Ray Villard
Space Telescope Science Institute, Baltimore, MD
(Phone: 410/338-4514)

For Release
May 6, 1997

NOTE TO EDITORS: N97-32

MEDIA BRIEFING ON EARLY RESULTS FROM NEW HUBBLE SPACE TELESCOPE INSTRUMENTS SET FOR MAY 12

Images demonstrating the capabilities of the new instruments installed on NASA's Hubble Space Telescope during the servicing mission earlier this year will be released in a news briefing at the Goddard Space Flight Center, Greenbelt, MD, at 11 a.m. EDT, Monday, May 12.

The press briefing will be held at the Goddard Visitor Center auditorium on Soil Conservation Rd. in Greenbelt. The briefing will be carried live on NASA TV with two-way question and answer capability for reporters at participating NASA centers.

Panelists discussing the status of Hubbleand the early results from the Space Telescope Imaging Spectrograph (STIS) and the Near Infrared Camera and Multi-Object Spectrometer (NICMOS) will be:

Dr. Ed Weiler, Hubble Space Telescope Program Scientist, NASA Headquarters
Dr. Rodger Thompson, NICMOS Principal Investigator, University of Arizona, Tucson
Dr. Bruce Woodgate, STIS Principal Investigator, Goddard Space Flight Center
Dr. David Leckrone, Hubble Space Telescope Project Scientist, Goddard Space Flight Center

Media interested in attending the press conference at Goddard should contact Tammy Jones at 301/286-5566.

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Video Advisory

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release
May 6, 1997

Deanna Corridon
Headquarters, Washington, DC
(Phone: 202/358-1733)

VIDEO ADVISORY: V97-40

STUDENT WINNERS HONORED IN WASHINGTON, DC

On NASA Television Tuesday, twenty-seven winners from across the country won national recognition in NASA's 17th annual Space Science Student Involvement Program competition. The students will be honored along with their teachers at the National Space Science Symposium, May 6, in Washington, DC. The competition is designed to promote interdisciplinary skills in the areas of science, critical and creative thinking, mathematics and technology. Interviews with program directors, students, and teachers included.

ITEM #1: REPLAY - B-ROLL OF STUDENT PROJECTS

Footage of student projects.

ITEM #1b: REPLAY - INTERVIEWS

Various interviews with program directors, students, and teachers. *For more information, contact Beth Schmid at (202) 358-1760.*

Video news file today at noon, 3, 6, 9 p.m. and midnight EDT.

NTV is available on GE-2, transponder 9C at 85 degrees West longitude, vertical polarization, with a frequency of 3880 MHz, and audio of 6.8 MHz.

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(202) 358-1600

For Release

Beth Schmid
Headquarters, Washington, DC
(Phone: 202/358-1760)

May 6, 1997

RELEASE: 97-90

"MATHLETES" CONVERGE ON WASHINGTON MAY 9

The nation's top seventh- and eighth-grade mathematics students are coming to Washington on May 9, each with the goal of becoming the number one junior high school "mathlete," winning a gold medal, $8,000, and a week at U.S. Space Camp in Huntsville, AL.

The competition finals on May 9 will be open to the press at 11 a.m. EDT and will be held at the Omni Shoreham Hotel, Regency Ballroom, 2500 Calvert St., NW, Washington, DC.

NASA is a sponsor of MATHCOUNTS, a national grassroots mathematics coaching and competition program promoting seventh- and eighth-grade mathematics achievement with the challenge and excitement of a school sports event. MATHCOUNTS is hosting its 14th National Competition, which tests students' speed, precision and endurance. Fifty-seven teams, representing all states, the District of Columbia, Puerto Rico, U.S. Defense Department and State Department dependent schools worldwide, Guam, U.S. Virgin Islands, and the Commonwealth of the Northern Mariana Islands, will compete.

Of the 228 team members participating in the National Competition, ten students will qualify to compete for the title of 1997 MATHCOUNTS National Champion. They will meet in the final event -- the Countdown Round -- a fast-paced game-show-like competition that sets one calculating student against another. In this one-on-one oral elimination event, students race the clock and each other; they have up to 45 seconds to solve each problem, hit the buzzer and answer correctly. The Countdown Round begins at 12:05 p.m. EDT and will continue for about 45 minutes.

The MATHCOUNTS program is the only program of its kind and is open to all public, private and parochial schools. Sponsors target seventh- and eighth-grade students to reach them at a critical time in their development and interest in mathematics.

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News Release

National Aeronautics and
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(202) 358-1600

For Release

James Cast
Headquarters, Washington, DC
(Phone: 202/358-1779)

May 6, 1997

Keith Henry
Langley Research Center, Hampton, VA
(Phone: 757/864-6120)

RELEASE: 97-91

HEAT-RESISTANT MATERIAL LICENSED FOR HIGH-PERFORMANCE PISTONS

NASA has granted a California company the first license to use a tough, space-age material to make high-performance pistons for internal combustion engines. Other potential license applications could include oilless pistons for natural gas pumps; recreational vehicle engines for snowmobiles, motorcycles, hovercraft and jet-skis; and weight-critical applications like ultralight aircraft engines.

Hitco Technologies, Gardena, CA, was granted exclusive rights to make, sell and use carbon-carbon pistons for high-performance automotive applications and co-exclusive rights for competition racing and small-to-large-bore diesel engines in the United States and certain foreign countries. The company intends to develop and manufacture the pistons at its factory in Gardena.

Carbon-carbon pistons offer significant weight savings and improved thermal performance over their aluminum and steel counterparts, as well as improving performance and reducing emissions.

The material was originally developed in the 1960's as a high-strength heat shield material for strategic missile applications. Today it is widely used for brakes in aircraft, clutches in Formula One and Indy race cars, and for military and aerospace applications like the nose cap of the Space Shuttle.

Researchers at NASA's Langley Research Center, Hampton, VA, have successfully tested prototype pistons in various size gasoline engines and have patented a number of concepts relating to carbon-carbon pistons for internal combustion engines. Carbon-carbon composite will maintain its strength and stiffness at operating temperatures well above 2,500 degrees Fahrenheit and has nearly zero thermal expansion.

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Pistons used in high-performance internal combustion engines usually are made of an aluminum alloy. The strength and stiffness of aluminum alloys decrease rapidly as material temperatures rise above 350 degrees Fahrenheit. (Aluminum alloys melt at approximately 1,100 degrees.) Aluminum alloy also expands significantly with heat.

"Carbon-carbon is the material of choice for the most demanding applications," according to Burton Northam of Langley's Environmental Interactions Branch, and a carbon-carbon piston researcher.

Northam worked with Langley researchers Philip Ransone, Kevin Rivers and Philip Glaude in carrying on the pioneering work of Langley's Allan Taylor begun in the mid-1980s.

Langley's Technology Applications Group is seeking additional licensing partners for carbon-carbon piston technology, as well as for related technologies for cylinder liners, exhaust manifolds, engine valves, turbo-charger housings and rotary engine components.

- end -

Video Advisory

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

Deanna Corridon
Headquarters, Washington, DC
(Phone: 202/358-1733)

For Release
May 7, 1997

VIDEO ADVISORY: V97-41

2000 STUDENT BUILDERS CREATE A SHUTTLE

On NASA Television Wednesday, 2,000 children from Mississippi, Louisiana and Alabama attended "Build the Shuttle Day" at the Stennis Space Center (SSC), MS, and had the opportunity to help build a 12-foot Space Shuttle made from LEGO blocks. NTV also will replay animation depicting Comet Hale-Bopp losing its plasma ion tail. Scientists at the Goddard Space Flight Center, Greenbelt, MD, predict that the comet's tail will be disrupted as it nears the Sun.

ITEM #1: "BUILD THE SHUTTLE" DAY

Footage of students assembling the shuttle. *For more information, contact Beth Schmid at (202) 358-1760 and Lanee Cobb at (601) 688-3341.*

ITEM #2: REPLAY - A TAIL OF A COMET

Animation depicting Comet Hale-Bopp losing its tail as it nears the Sun. *For more information, contact Don Savage at (202) 358-1547 or William Steigerwald at (301) 286-1085.*

Video news file today at noon, 3, 6, 9 p.m. and midnight EDT.

NTV is available on GE-2, transponder 9C at 85 degrees West longitude, vertical polarization, with a frequency of 3880 MHz, and audio of 6.8 MHz.

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Video Advisory

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

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May 8, 1997

Deanna Corridon
Headquarters, Washington, DC
(Phone: 202/358-1733)

VIDEO ADVISORY: V97-42

"NEW" X-33 ANIMATION ON NTV

On Thursday, NASA Television unveils the latest X-33 animation. The X-33 is one of the next generation of reusable launch vehicles designed to greatly reduce the cost of putting payloads into orbit. NASA TV also will televise footage of the liquid oxygen tank barrel and dome assemblies for the X-33, being readied for welding at the NASA Michoud Assembly Facility, New Orleans, LA. Replaying on NTV will be B-roll of children from Mississippi, Louisiana and Alabama attending "Build the Shuttle Day" at the Stennis Space Center (SSC), MS, building a 12-foot Space Shuttle made from LEGO blocks.

ITEM #1: NEW X-33 ANIMATION

The latest X-33 animation includes: pre-launch, launch of the X-33 from Edwards Air Force Base, CA; in-flight shots; landing at potential Western U.S. landing sites; ferry flight back to CA launch site; preparations for re-flight. **Please note that NEW animation replaces any previous animation.** *For more information, contact Dwayne Brown at (202) 358-1726.*

ITEM #1a: X-33 LIQUID OXYGEN TANK

B-roll of the liquid oxygen tank barrel and dome assemblies for the X-33 being aligned for welding. *For more information, contact Dwayne Brown at (202) 358-1726.*

ITEM #2: REPLAY - "BUILD THE SHUTTLE" DAY

Footage of students assembling the shuttle. *For more information, contact Lanee Cobb at (601) 688-3341.*

Video news file today at noon, 3, 6, 9 p.m. and midnight EDT.

NTV is available on GE-2, transponder 9C at 85 degrees West longitude, vertical polarization, with a frequency of 3880 MHz, and audio of 6.8 MHz.

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News Release

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

Douglas Isbell
Headquarters, Washington, DC
(Phone: 202/358-1753)

Lynn Chandler
Goddard Space Flight Center, Greenbelt, MD
(Phone: 301/286-9016)

Sally Pobojewski
University of Michigan, Ann Arbor, MI
(Phone: 313/647-1844)

For Release
May 9, 1997

RELEASE: 97-92

HYAKUTAKE X-RAYS SHOW ABILITY TO MONITOR COMETS AND SOLAR WIND

A supercomputer simulation of Comet Hyakutake's interaction with the solar wind demonstrates that resulting X-ray emissions can be used to monitor comets and solar wind phenomena, NASA-funded researchers write in today's issue of "Science."

The simulation was conducted using an Earth sciences supercomputer at the NASA Goddard Space Flight Center, Greenbelt, MD. The results match and explain March 27, 1996, observations of Comet Hyakutake by Germany's ROSAT satellite, the first detection of X-ray emissions from any comet. The model also supports a leading theory for how the X-rays are generated.

"Cometary X-rays present a potentially powerful new tool to monitor comet activity far from Earth, as well as the composition and flux of the solar wind," said co-author Dr. Tamas Gombosi of the University of Michigan, Ann Arbor. "By capturing these X-rays' detailed energy spectrum, it might be possible to monitor the propagation and evolution of spectacular solar wind phenomena, such as the coronal mass ejections seen this January and April."

About one percent of the solar wind, which flows from the Sun out past Pluto, is composed of minor ions: atoms (such as oxygen, carbon and neon) that have been nearly stripped of their electrons and thus have a high positive charge. Dr. Thomas Cravens of the University of Kansas theorizes that these minor ions steal electrons from neutral atoms and molecules of cometary origin. The electrons are first seized in excited states, traveling in the ions' outer orbitals. As the electrons fall to lower orbitals, Cravens' theory asserts that X-rays are emitted, in addition to other forms of radiation.

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"Considering the magnitude and shape of the emission, we believe the most satisfactory theory to be this mechanism of charge exchange excitation," Gombosi said. "Other explanations produce neither the crescent pattern nor the intensity observed by ROSAT and duplicated by our simulation."

Within this pattern, some electron orbital transitions emit distinct wavelengths of X-rays that can be measured. The computer simulation shows that the overall X-ray spectrum for Comet Hyakutake depends mainly on the solar wind composition, and not on the comet. Because of this independence, researchers can determine the relative size of the comet's atmosphere from the proximity of the brightest X-rays to the icy nucleus.

"In Hyakutake, the brightest X-ray region was 18,700 miles (30,000 kilometers) ahead of the comet, on the Sun side," said University of Michigan co-author Dr. Michael Combi. "If the comet has enough of an atmosphere, the solar wind minor ions recombine with electrons far from the nucleus. If the comet were producing less atmospheric gas, the place of maximum emission would be closer to the nucleus," Combi said.

This theory will be tested on Comet Hale-Bopp, which is scheduled to be observed by Japan's ASCA X-ray satellite this September. "Comet Hale-Bopp should have the emission shifted further sunward; it is bigger than Hyakutake," Combi said.

Active comets are typically first observed in visible light at large distances from the Sun. After discovery, the orbits of comets can be established with very high accuracy as they pass through the inner solar system. "If X-rays are observed from the known location of a comet, one can conclude with great confidence that the X-rays originated from the comet," Gombosi said.

The University of Michigan team used March 27, 1996, solar wind density measurements from NASA's WIND spacecraft. Their model first considers the global interaction of the solar wind with the comet. It projects the comet into a three-dimensional grid that automatically applies finer resolution where more activity occurs. This physics component predicts the deflective paths and speed of the solar wind traveling through the comet.

Other co-authors of the "Science" paper are Roman Haberli, Darren De Zeeuw and Kenneth Powell. The University of Michigan team is one of nine Grand Challenge Investigations funded by the NASA High Performance Computing and Communication Program's Earth and Space Sciences Project. Additional funding comes from NASA's Office of Space Science, the National Science Foundation and the Swiss National Science Foundation.

Simulation images are available on the World Wide Web at URL:

http://hpcc.engin.umich.edu/HPCC/recent3/index.html

-end-

Video Advisory

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

Debbie Rivera
Headquarters, Washington, DC
(Phone: 202/358-1743)

For Release
May 12, 1997

VIDEO ADVISORY: V97-43

HUBBLE: "I CAN SEE CLEARER NOW"; STS-84 TO THE RESCUE

On Monday, NASA Television brings new and improved images from the Hubble Space Telescope. These are the first images released since astronauts serviced the telescope in February. In addition, the STS-84 b-roll package begins with shots of the replacement Elektron oxygen generator for the Mir space station. Launch of STS-84 is scheduled for May 15.

ITEM #1: I CAN SEE CLEARER NOW - Animation
Before and after shots from Hubble's two new instruments. *For more information on the entire Hubble package, contact Don Savage at (202) 358-1727.*

ITEM #1a: HUBBLE SPACE TELESCOPE - Animation
Two beauty shots of the orbiting space telecope.

ITEM #1b: HUBBLE'S NEW EYES, PART 1 - Animation
Shows the Space Telescope Imaging Spectrograph or STIS.

ITEM #1c: CLEAN, CLEAN VIEWING MACHINE
B-roll contains shots of the preparation of the STIS instrument in the clean room.

ITEM #1d: HUBBLE'S NEW EYES, PART 2 - Animation
Shows the Near-Infrared Camera and Multi-Object Spectrometer (NICMOS).

ITEM #1e: BACK TO THE CLEAN
B-roll of NICMOS in the clean room being readied.

ITEM #1f: HIGHLIGHTS OF HUBBLE'S SERVICING
Footage includes best shots of the STS-82 servicing mission.

ITEM #2: BETTER AIR IS ON THE WAY
Shows the installation of the Elektron oxygen-generator for Mir aboard STS-84.

ITEM #2a: BEAUTY SHOTS OF MIR

ITEM #2b: STS-84 CREW INTERVIEWS

Video news file today at noon, 3, 6, 9 p.m. and midnight EDT.

NTV is available on GE-2, transponder 9C at 85 degrees West longitude, vertical polarization, with a frequency of 3880 MHz, and audio of 6.8 MHz.

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News Release

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Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Donald Savage
Headquarters, Washington, DC
(Phone: 202/358-1547)

May 12, 1997

Tammy Jones
Goddard Space Flight Center, Greenbelt, MD
(Phone: 301/286-5566)

Ray Villard
Space Telescope Science Institute, Baltimore, MD
(Phone: 410/338-4514)

RELEASE: 97-93

HUBBLE'S UPGRADES SHOW BIRTH AND DEATH OF STARS; DISCOVER MASSIVE BLACK HOLE

Three months after an orbital house call by astronauts, new instruments aboard NASA's Hubble Space Telescope are helping astronomers probe the universe in greater detail than ever before.

New data released by NASA today include direct evidence of a supermassive black hole and remarkable new details on the explosive life cycle of stars. NASA also reported that all new Hubble instruments and upgrades are generally performing well.

"We're extremely excited about the quality and precision of the images from Hubble," said Wes Huntress, NASA Associate Administrator for Space Science. "Following check-out of the instruments, Hubble will return to full science operations, and we can expect a continuing flow of new and exciting discoveries."

These initial results clearly demonstrate the ability of the new instruments to fulfill their science goals with the Hubble Telescope, say project astronomers. Project officials are pleased to report that other instruments and electronics installed during the second servicing mission are generally performing well.

Among Hubble's recent observations:

Jets and Gaseous Disk Around the Egg Nebula -- A new infrared instrument peered deep into the dust-obscured central region around a dying star

-more-

embedded in the Egg nebula, a cloud of dust and gas 3,000 light years from Earth. The new images provide a clear view of a twin pair of narrow bullet-shaped "jets" of gas and dust blasted into space. The instrument, called the Near Infrared Camera and Multi-Object Spectrometer, also revealed an unusual scalloped edge along a doughnut-shaped molecular hydrogen cloud in the nebula.

"Because we can now see these 'missing pieces' in infrared and visible light, we have a more complete view of the dynamic and complicated structure of the star," said Rodger Thompson of the University of Arizona, Tuscon, the principal investigator for the infrared instrument. "It also allows us to see a 'fossil record' of the star's late evolutionary stages."

Unveiling Violent Starbirth in the Orion Nebula - The new infrared instrument penetrated the shroud of dust along the back wall of the Orion nebula, located in the "sword" of the constellation Orion. Data revealed what can happen to a stellar neighborhood when massive young stars begin to violently eject material into the surrounding molecular cloud. Although ground-based infrared cameras have previously observed this hidden region known as OMC-1, the Hubble's new instrument provides the most detailed look yet at the heart of this giant molecular cloud. Hubble reveals a surprising array of complex structures, including clumps, bubbles, and knots of material. Most remarkable are "bullets" composed of molecular hydrogen -- the fastest of which travels at more than one million mph (500 km/s). These bullets are colliding with slower-moving material, creating bow shocks, like a speedboat racing across water.

Monster Black Hole in Galaxy M84 - In a single exposure, a new powerful instrument called the Space Telescope Imaging Spectrograph discovered a black hole at least 300 million times the mass of the Sun. The spectrograph made a precise observation along a narrow slit across the center of galaxy M84, located 50 million light-years away. This allowed the instrument to measure the increasing velocity of a disk of gas orbiting the black hole. To scientists, this represents the signature of a black hole, among the most direct evidence obtained to date. Due to their nature, it's impossible to directly photograph black holes. Scientists must instead look for clues to show the effects of black holes on surrounding dust, gas and stars.

"Hubble proved the existence of supermassive black holes three years ago," said Bruce Woodgate of the Goddard Space Flight Center, Greenbelt, MD, and principal investigator for the new spectrograph. "With this new instrument, we can do it 40 times faster than we used to."

Composition and Structure of the Ring Around Supernova 1987A - The new spectrograph also provides an unprecedented look at a unique and complex structure in the universe -- a light-year-wide ring of glowing gas around Supernova 1987A, the closest supernova explosion in 400 years. The spectrograph dissects the ring's light to tell scientists which elements are in the ring and helps paint a picture of the physics and stellar processes which created the ring. This gives astronomers better insight into how stars evolve and become a supernova, and into the origin of the chemical elements created in these massive explosions.

Hubble Status -- NASA project officials are encouraged that a problem detected earlier with one of the cameras on the infrared instrument has shown some improvement. The problem stems from the unexpected movement of the dewar -- an insulated vessel containing solid nitrogen at extremely cold temperatures. After launch, the nitrogen expanded more than expected as it warmed, moving the dewar into contact with another surface in the mechanism and pushing one of the cameras out of its range of focus. The camera has moved back about one-third of the distance required to be within reach of the instrument's internal focusing mechanism. This is because the dewar is "relaxing" toward its normal state, as pressure caused by the expansion of the nitrogen is reduced. The ice keeps the sensitive infrared detector cooled. Project officials also are considering how to deal with unexpected, excessive coolant loss.

"We are anticipating a shorter lifetime for the instrument, but we don't know how much shorter," said Goddard Hubble Project Scientist David Leckrone. "We are taking steps to work around the problem, and will increase the percentage of time this instrument will be used."

NASA officials also report that other upgrades to Hubble are performing well, including the newly installed solid state recorder, fine guidance sensor and solar array drive electronics. The solid state recorder has significantly improved data storage and playback, and the new fine guidance sensor is by far the best of the three on Hubble.

The Space Telescope Science Institute is operated by the Association of Universities for Research in Astronomy, Inc. (AURA) for NASA, under contract with the Goddard Space Flight Center. The Hubble Space Telescope is a project of international cooperation between NASA and the European Space Agency (ESA).

-end-

EDITOR'S NOTE: Images to accompany this release are available to news media representatives by calling the Headquarters Imaging Branch on 202/358-1900.

NASA photo numbers are:

Color: 97-HC-311
Color: 97-HC-312
Color: 97-HC-313
Color: 97-HC-314

Images supporting this news release also are available via the Internet. For a complete listing of digital imagery, please visit TODAY@NASA at URL:

http://www.hq.nasa.gov/office/pao/NewsRoom/today.html

Video Advisory

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release
May 13, 1997

Debbie Rivera
Headquarters, Washington, DC
(Phone: 202/358-1743)

VIDEO ADVISORY: V97-44

REPLAY OF HUBBLE'S NEW IMAGES; BEETLE MANIA ABOARD STS-84

On Tuesday, NASA Television again will show the stellar images from the two new instruments aboard the Hubble Space Telescope. In addition, the STS-84 b-roll continues with a piece on the 64 desert beetles that may help scientists understand how space flight affects the human body's internal clock. Launch of STS-84 is scheduled for May 15.

ITEM #1: REPLAY - VIOLENT STARBIRTH IN ORION NEBULA
For more information on the entire Hubble package, contact Don Savage at (202) 358-1727.
ITEM #1a: REPLAY - JETS AND DISKS IN THE EGG NEBULA
ITEM #1b: REPLAY - PROOF OF A MONSTER BLACK HOLE
ITEM #1c: REPLAY - MONSTER BLACK HOLE IN M84
ITEM #1d: REPLAY - RING OF SUPERNOVA 1987A
ITEM #1e: REPLAY - SUPERNOVA 1987A RING COMPONENTS
ITEM #1f: REPLAY - SUPERNOVA 1987A RING ORIENTATION
ITEMS #1g-k REPLAY - ANIMATION OF HUBBLE, INSTRUMENTS; CLEAN ROOM
ITEM #1l: REPLAY - SERVICING MISSION HIGHLIGHTS
ITEM #2: BEETLE RHYTHM
Desert beetles help scientists understand changes in circadian rhythm. *For more information, contact Ann Hutchison at (415) 604-9000.*
ITEM #2a: INTERVIEW - DR. TANA HOBAN-HIGGINS, U. OF CA, DAVIS
ITEMS #3-6f REPLAY - STS-84 B-ROLL PACKAGE

Video news file today at noon, 3, 6, 9 p.m. and midnight EDT.

NTV is available on GE-2, transponder 9C at 85 degrees West longitude, vertical polarization, with a frequency of 3880 MHz, and audio of 6.8 MHz.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Douglas Isbell
Headquarters, Washington, DC
(Phone: 202/358-1547)

May 13, 1997

David Morse
Ames Research Center, Mountain View, CA
(Phone: 415/604-4724)

RELEASE: 97-94

NASA EARTH SCIENCE RESEARCH AIRCRAFT SOARS TO NEW HEIGHTS

A NASA ER-2 aircraft, complete with a full array of science instrument packages, recently conducted its first operational mission at an altitude of 70,000 feet, a key region for atmospheric research.

The vehicle currently is on deployment to Alaska for missions over the North Pole in support of a project known as POLARIS, which stands for Photochemistry of Ozone Loss in the Arctic Region In Summer. NASA has two such vehicles in its ER-2 fleet based at the Agency's Ames Research Center, Mountain View, CA. The ER-2 is a civilian version of the U-2 aerial reconnaissance plane.

A program to modernize the vehicles by making them lighter, more fuel efficient and more productive was completed recently. Over the next year, these improvements will increase significantly the size of science payloads and enhance the altitude performance of the ER-2s in support of NASA's Mission to Planet Earth enterprise.

Following a recent flight, Jim Barrilleaux, an ER-2 pilot and acting chief of Ames' High Altitude Missions branch, expressed his surprise at the magnitude of difference in feel and performance of the vehicle. "It flies like a completely new aircraft," he said. "It feels really tight."

Earth scientists also are excited about the enhanced capability. "It is really critical that we have access to consistent measurements at this key altitude, which is an intermediate region between aerosol particle-driven processes measured by standard aircraft-based sensors and gas-phase processes monitored by orbiting satellites," said Dr. Michael Kurylo, manager of the Upper Atmosphere Research Program at NASA Headquarters, Washington, DC.

-more-

The first deployment of an upgraded ER-2 currently is being conducted over the North Pole through May 15. The present POLARIS payload utilizes two large superpods attached to the wings. This more than doubles the available volume for science instruments, while still permitting operation at enhanced altitudes of 70,000 feet and above, according to flight engineers.

The POLARIS mission is seeking to understand the fundamental chemistry that dominates the naturally occuring seasonal reduction of ozone over the pole in the course of the Arctic summer. Many of the chemical reactions in which project scientists are interested in occur at altitudes in the 75,000-foot range. Now, even a fully loaded ER-2 can operate approximately 2,500 feet higher than previously possible due to lower fuel requirements and lighter aircraft weight. This increased altitude capability permits extension of in-place measurements for validating and upgrading existing models of the upper atmosphere.

Additional information about POLARIS can be obtained at the website:

http://cloud1.arc.nasa.gov/polaris

NASA's Mission to Planet Earth program is a long-term, internationally coordinated research effort to study the Earth as a global environmental system.

-end-

Video Advisory

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

Debbie Rivera
Headquarters, Washington, DC
(Phone: 202/358-1743)

For Release
May 14, 1997

VIDEO ADVISORY: V97-45

HOW "HOT 'LANTA" AND OTHER CITIES MAY KEEP THEIR COOL

On Wednesday, the NASA TV video package shows how researchers may look to trees and "urban forests" for help in cooling the overall temperature of our cities. These "green areas" have been found to absorb heat from asphalt and concrete, and use it to evaporate water from leaves -- cooling the surrounding air. The NASA study is in collaboration with ten Atlanta schools, the Atlanta Regional Commission and the Environmental Protection Agency. In addition, the STS-84 b-roll continues with launch scheduled for May 15.

ITEM #1: MOTHER NATURE'S AIR CONDITIONER
Study of how trees may be key to lower cooling costs in cities. *For more information, contact David Steitz at (202) 358-1600.*
ITEM #1a: INTERVIEW - DALE QUATTROCHI, NASA SCIENTIST
ITEM #1b: INTERVIEW - JEFF LUVALL, NASA SCIENTIST
ITEM #1c: INTERVIEW - DANIEL SWARTZ, STUDENT

ITEM #2: REPLAY - BEETLE RHYTHM
ITEM #2a: REPLAY - TANA HOBAN-HIGGINS, U. OF CA, DAVIS

ITEMS #3-6f REPLAY - STS-84 B-ROLL PACKAGE
Includes Elektron installation, Mir video, STS-84 crew arrival and interviews.

Video news file today at noon, 3, 6, 9 p.m. and midnight EDT.

NTV is available on GE-2, transponder 9C at 85 degrees West longitude, vertical polarization, with a frequency of 3880 MHz, and audio of 6.8 MHz.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

May 14, 1997

Donald Savage
Headquarters, Washington, DC
(Phone: 202/358-1547)

Junichiro Kawaguchi
Japan Institute of Space and Astronautical Science
Sagamihara-shi, Japan
(Phone: 81-427-51-3911)

RELEASE: 97-95

NASA AND JAPAN TO COOPERATE ON ASTEROID SAMPLE RETURN MISSION

NASA and Japan's Institute of Space and Astronautical Science (ISAS) have agreed to cooperate on the first mission to collect samples from the surface of an asteroid and return them to Earth for in-depth study.

Known as MUSES-C, the mission will be launched on a Japanese M-5 launch vehicle in January 2002 from Kagoshima Space Center, Japan, toward a touchdown on the asteroid Nereus in September 2003. A NASA-provided miniature robotic rover will conduct in-situ measurements on the rocky surface.

The asteroid samples will be returned to Earth by MUSES-C via a parachute-borne recovery capsule in January 2006, just weeks after a NASA mission named Stardust is expected to return collected comet dust samples to Earth.

NASA and ISAS will cooperate on several aspects of the mission, including mission support and scientific analysis. Dr. Atsuhiro Nishida, Director General of ISAS, and Dr. Wesley T. Huntress Jr., NASA Associate Administrator for Space Science, signed a summary of discussions outlining the cooperation on MUSES-C during a May 2 meeting in Washington, DC.

"This ambitious mission is an opportunity for two spacefaring nations to combine their expertise and achieve something truly fantastic," said Dr. Jurgen Rahe, director of Solar System Exploration at NASA Headquarters. "The rover will be the smallest ever flown in space. With a successful mission, we will have the first direct insight into the composition of the materials that helped form the rocky inner planets more than four billion years ago."

-more-

With a mass of less than 2.2 pounds, the asteroid rover technology experiment would be a direct descendant of the technology used to build the Sojourner rover due to land on Mars with the Mars Pathfinder lander on July 4 of this year. The rover will carry two science instruments: a visible imaging camera and a near-infrared point spectrometer. It will be designed and built by NASA's Jet Propulsion Laboratory, Pasadena, CA.

Other U.S. contributions to MUSES-C include testing of its reentry capsule heat shield at NASA's Ames Research Center, Mountain View, CA, and navigation and tracking support from the ground-based Deep Space Network. NASA also will provide co-investigators to join in the mission's science, and the Agency will share in access to the asteroid samples.

Nereus is a small, near-Earth asteroid roughly one mile in diameter. It was discovered in 1982. At its closest point to the Sun, its orbit takes it just inside the orbit of the Earth.

MUSES-C will continue a recent string of missions focused on asteroids. NASA's Galileo mission, now in looping orbit around Jupiter, flew by two asteroids -- Gaspra and Ida -- on its way to the giant gas planet, discovering a small moonlet around one of them. The Near Earth Asteroid Rendezvous spacecraft, a NASA Discovery Program mission built and operated by the Johns Hopkins University's Applied Physics Laboratory, will fly by the asteroid Mathilde on June 27 on its way to orbit the large asteroid Eros in 1999.

-end-

Nev/s Release

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release

David E. Steitz
Headquarters, Washington, DC
(Phone: 202/358-1730)

May 14, 1997

Dave Drachlis
Marshall Space Flight Center, Huntsville, AL
(Phone: 205/544-0034)

RELEASE: 97-96

NASA STUDYING HOW TO USE MOTHER NATURE'S AIR CONDITIONERS TO KEEP OUR CITIES COOL

Using space-age technology, NASA researchers are studying how "urban forests" may allow cities to continuously grow while maintaining air quality and the environment, as well as lower cooling costs during sweltering summer months.

Collaborating with ten Atlanta schools, the Atlanta Regional Commission and the Environmental Protection Agency, two NASA researchers from the Global Hydrology and Climate Center at the Marshall Space Flight Center, Huntsville, AL, began a study in Atlanta this week to learn how rapid urbanization affects temperature and air quality, and what can be done to lessen the impact.

The researchers, Dr. Jeff Luvall and Dr. Dale Quattrochi, are studying bubble-like accumulations of hot air, called urban heat islands, that have developed as Atlanta has grown during the past 20 years. "Urban heat islands result when naturally vegetated surfaces are replaced with asphalt, concrete, rooftops and other man-made materials," said Quattrochi.

According to Quattrochi, the temperatures of artificial surfaces can be 20- 40 degrees higher than those of vegetated surfaces. "Materials, such as asphalt, store much of the Sun's energy and remain hot long after sunset," said Quattrochi. "This produces a dome over the city of temperatures 5-10 degrees higher than air temperatures over adjacent rural areas."

-more-

"The more a city grows -- replacing trees and grass with buildings and roads -- the warmer it becomes, increasing peak power demands. To meet these demands, power plants must utilize fossil fuels to a greater extent, which ultimately have a negative impact on air quality," said Luvall. In findings from similar studies, the two researchers found that city parks and other urban areas with trees and grass were cooler than parking lots and areas with a high concentration of buildings. "These 'green areas' are cooler because they dissipate solar energy by absorbing surrounding heat and using it to evaporate water from leaves, thereby cooling the air," said Luvall. Urban forests also help cool cities by shading surfaces like asphalt, roofs and concrete parking lots, preventing the initial heating and storage of heat.

To determine where Atlanta's hot spots are, a Lear Jet equipped with thermal imaging equipment flew over the metropolitan area on May 11 and 12 taking heat images at mid-day -- the period of maximum heating -- and again 12 hours later when surfaces began to cool.

On the ground, some Atlanta elementary students took part in the experiment by taking temperature and moisture readings of different surfaces at their schools in conjunction with the mid-day flight. The students will compare and verify their measurements with those recorded by instruments on the jet.

Information collected from the air study will allow researchers to understand the effect of tree cover -- or lack thereof -- on Atlanta's temperature and air quality. These findings also will provide Atlanta's urban planners a foundation to determine the benefits of developing and maintaining urban forests. Additional benefits may come from building plans that incorporate trees to shade roofs and reduce the heat load on houses and buildings, thus reducing power requirements.

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News Release

National Aeronautics and
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Washington, DC 20546
(202) 358-1600

For Release

Debra Rahn
Headquarters, Washington, DC
(Phone: 202/358-1778)

May 14, 1997

Eileen Hawley
Johnson Space Center, Houston, TX
(Phone: 281/483-5111)

RELEASE: 97-97

BIENNIAL ASTRONAUT SELECTION PROCESS BEGINS

NASA is accepting applications for mission specialist and pilot astronauts for the current selection cycle. Interested individuals may apply until the cut-off date of July 1, 1997. Applications received after the deadline will be eligible for consideration in the next selection cycle.

Successful pilot applicants typically have extensive piloting experience in high performance jet aircraft and flight experience.

Successful applicants for the mission specialist positions typically have significant backgrounds in engineering or the sciences (materials science, Earth science, medical science, and space science).

After a six-month process, including screening applications and conducting interviews and medical evaluations, selections will be announced in early 1998 with the new astronaut candidates reporting to the Johnson Space Center, Houston, in the summer of 1998.

"We are looking for individuals who not only are outstanding in their chosen field of work, but also possess the ability to get along with others and work in a diverse, multi-cultural environment," said David C. Leestma, director of Flight Crew Operations. "We are in a very challenging and dynamic time in human space exploration, and the people we choose will be an integral part of this nation's reach for the stars."

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NASA accepts applications for mission specialist and pilot astronaut positions on a continuing basis.

An application package may be obtained by calling the Astronaut Selection Office at 281/483-5907, or writing to:

NASA-Johnson Space Center
Astronaut Selection Office
Mail Code AHX
Houston, TX 77058-3696

-end-

News Release

National Aeronautics and
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Washington, DC 20546
(202) 358-1600

For Release

Brian Dunbar
Headquarters, Washington, DC
(Phone: 202/358-0873)

May 15, 1997

RELEASE: I97-6

NASA RELEASES FIRST VERSION OF ONLINE PHOTO DATABASE

A new online collection of NASA photographs and images provides a single point of entry to various photographic databases of six NASA centers. The NASA Image Exchange (NIX) at:

http://nix.nasa.gov

provides an umbrella over existing photo databases at the centers, providing better access to photos for NASA personnel and the general public. Search capabilities of NIX include simple searches, complex searches, and browse searches (prebuilt searches on a number of preselected topics). NIX also provides tips to users on searching, copyright information, and a comments section.

The NIX effort, which was spearheaded by NASA's Scientific and Technical Information Program Office at Langley Research Center, Hampton, VA, is a voluntary association of STI, Public Affairs, Web, photographic, graphic and library personnel from all 10 NASA centers.

The STI Program Office is issuing grants to selected NASA centers for the expansion of the capability of NIX.

- end -

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Debra Rahn / Michael Braukus
Headquarters, Washington, DC
(Phone: 202/358-1639)

May 15, 1997

James Hartsfield
Johnson Space Center, Houston, TX
(Phone: 281/483-5111)

RELEASE: 97-98

SPACE STATION CONTROL BOARD APPROVES NEW ASSEMBLY SCHEDULE

The International Space Station Control Board has approved a new baseline schedule that keeps the assembly sequence intact and targets the first station launch for June 1998 -- an eight-month delay from the previous schedule.

As announced by NASA in April, the revision in the station's assembly schedule is the direct result of funding delays in the construction of the Service Module, the primary Russian contribution to the early assembly of the station and a component that will supply the early living quarters, life support systems and propulsion. Russian-funded work on the Service Module now has fully resumed as a result of Russian government funding, and it is rapidly progressing.

"The recent completion of a major Russian general designers review for the Service Module, in which I participated, and full Russian funding of the work, gives us high confidence that the Service Module can meet a revised launch date of December 1998," Program Manager Randy Brinkley said. "The Russian Space Agency has been extremely forthcoming in its dealings with NASA on this subject, and they and their contractors have gone out of their way to demonstrate their resolve to meet their commitment. Based on what I saw and heard during my most recent visit to Russia, I have every confidence that RSA and the Russian space industry are fully committed to meeting their obligations for the Service Module and ISS."

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Although the first station launch, the launch of the Functional Energy Block (FGB) on a Russian Proton booster, is delayed by eight months in the new schedule, the beginning of full-fledged research flights to the station in August 1999 -- the end of Phase 2 of the program -- is a delay of only four months from what previously had been planned. To enhance the station's capabilities, modifications will be made to the FGB to allow it to be refueled and to accommodate dockings by Russian Soyuz capsules.

Despite delays in the Russian hardware, work has continued on all U.S. station components, and the first U.S.-built component, Node 1, will be delivered to the Kennedy Space Center this summer for pre-launch testing and processing. Node 1 will be launched on Space Shuttle mission STS-88 in July 1998 to be mated to the already-orbiting FGB. Because U.S. components such as the laboratory module, the first truss segment and the first solar array remain on schedule, NASA will take advantage of the extra time in assembly to pursue integrated testing of components after they are shipped to KSC.

"A little more than a year from now, we'll launch the first component. About a year and a half from now, we will launch the first crew. Only two years from today, that first crew will be finishing up the first tour onboard. Four Shuttle assembly flights will already have been completed. And we'll be only a few months from completing Phase 2 of the program," Brinkley said. "This spacecraft is on deck, and we are number one on the runway."

Other highlights of the new schedule, called the ISS Assembly Sequence, Rev. C, include:

• In January 1999, the second Space Shuttle assembly mission, designated STS-92 and assembly Flight 3A, will be launched and later followed by a Russian Soyuz spacecraft carrying the first crew -- ISS Commander Bill Shepherd, Soyuz Commander Yuri Gidzenko and Flight Engineer Sergei Krikalev -- to begin a permanent human presence on the ISS.

• Two Space Shuttle flights have been added to the assembly sequence to increase margin and add flexibility. The flights, called flight 2A.1 in late 1998 and flight 7A.1 in late 1999, may be used to offload cargo from adjacent assembly flights and assist with U.S. outfitting of the station.

• At present, NASA plans to continue the conversion of a Naval Research Laboratory stage into an Interim Control Module (ICM), that could be used to augment the station's future propulsion capabilities if needed by being attached to either the Functional Cargo Block (FGB) or the Service Module.

• Assembly flight 13A, a shuttle mission that carries two additional solar arrays, has been realigned earlier in the assembly sequence and will provide additional power for scientific activities and station assembly.

• Launch date options for the European Space Agency's Columbus Orbital Facility remain under evaluation. While these options are analyzed, the launch dates for all flights after Utilization Flight 5 in June 2002 will remain under review; however, the U.S. Habitat Module will be fully outfitted by December 2002 regardless of the launch options chosen. These launch dates are expected to be set at a Space Station Control Board meeting in Fall 1997.

A fact sheet on the new assembly sequence, graphics, this news release and other updated information on the International Space Station is available on the Internet in a preview of a new ISS web site under development at:

http://station.nasa.gov

and for the assembly sequence:

http://station.nasa.gov/station/assembly/chron.html

This site will be accessible as of 8 a.m.EDT on Thursday, May 15, 1997.

-end-

News Release

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

Michael Braukus
Headquarters, Washington, DC
(Phone: 202/358-1979)

For Release
May 16, 1997

RELEASE: 97-99

UKRAINIAN PAYLOAD SPECIALISTS SELECTED FOR SHUTTLE MISSION

NASA today announced the selection of Col. Leonid Kadenyuk, the first Ukrainian to fly on the U.S. Space Shuttle, as the primary payload specialist for the fourth U.S. Microgravity Payload flight scheduled for a November 1997 launch on the Space Shuttle Columbia as mission STS-87.

The announcement comes as the first session of the U.S./Ukraine Binational Commission convened today at the White House. The Commission is co-chaired by Vice President Al Gore and Ukrainian President Leonid Kuchma.

NASA also named another Ukrainian, Dr. Yaroslav Pustovyi, to serve as an alternate. As an alternate payload specialist, Pustovyi will undergo the same training as Kadenyuk and will be ready to serve on the mission crew if necessary.

Kadenyuk will conduct the Collaborative Ukrainian Experiment (CUE), a series of 11 Shuttle middeck experiments focusing on the effects of microgravity on plant growth and pollination.

The CUE project resulted from the November 1994 summit meeting between President Bill Clinton and Ukrainian President Leonid Kuchma. At that time, the two presidents signed the "Agreement Between the United States of America and Ukraine on Cooperation in the Exploration and Use of Outer Space for Peaceful Purposes" and announced that a Ukrainian representative would fly on a future Space Shuttle mission. NASA and the National Space Agency of Ukraine (NSAU) were designated as implementing agencies for carrying out U.S./Ukrainian cooperative space activities.

U. S. and Ukrainian scientists will collaborate on the plant experiments to be carried out by the Ukrainian payload specialist during the flight. The 11 CUE investigations, which use the Shuttle's Plant Growth Facility and Biological Research in Canisters hardware, consist of five primary and six secondary experiments.

Six U.S. and 16 Ukrainian principal investigators are collaborating on the experiments, which will study the effect of microgravity on pollination, fertilization and flowering of plants and seedlings. The research also furthers the study of previously observed abnormal growth and developmental phenomena involving plants in space.

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A significant element of CUE is its large educational component. High school students in both countries will perform a plant pollination experiment on the ground at the same time the experiment is conducted on the Shuttle. The payload specialist will discuss the experiment with students during scheduled educational downlinks from the Shuttle.

Kadenyuk was selected as a Russian cosmonaut in 1976. He has trained for and studied systems for the Soyuz, Soyuz-TM, MTKK, Buran, and Space Stations Salyut and Mir. He was born in the village of Klishkovtsiy in the Khotinsky Region of the Chernovitsky District. He is currently employed by the Kiev Botanical Institute of the National Academy of Sciences of Ukraine.

Pustovyi is a graduate of the Military Space-Engineer Academy, and received a doctorate in Radio Physics from Kharkiv State University. He is employed by the Institute of Magnetism at the National Academy of Sciences of Ukraine.

The other members of the STS-87 crew are Commander Kevin Kregel, Pilot Steven Lindsey (Major, USAF) and Mission Specialists Winston Scott (Captain, USN), Kalpana Chawla, Ph.D. and Takao Doi, Ph.D. (NASDA).

- end -

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

Donald Savage
Headquarters, Washington, DC
(Phone: 202/358-1547)

Tammy Jones
Goddard Space Flight Center, Greenbelt, MD
(Phone: 301/286-5566)

Ray Villard
Space Telescope Science Institute, Baltimore, MD
(Phone: 410/338-4514)

Diane Ainsworth
Jet Propulsion Laboratory, Pasadena, CA
(Phone: 818/354-5011)

For Release
May 20, 1997

RELEASE: 97-100

HUBBLE FINDS CLOUDY, COLD WEATHER CONDITIONS FOR MARS-BOUND SPACECRAFT

As two NASA spacecraft speed toward a mid-year rendezvous with Mars, astronomers using the Hubble Space Telescope are providing updated planetary weather reports to help plan the missions.

Hubble's new images show that the "martian invasion" of spacecraft will experience considerably different weather conditions than seen by the last U.S. spacecraft to land on Mars 21 years ago.

Martian atmospheric conditions will affect the operation of both the Mars Pathfinder landing on July 4, and the September 11 arrival of the Mars Global Surveyor which will map the planet from orbit. Hubble images taken barely three weeks apart, on March 10 and March 30, reveal dramatic changes in some local conditions, and show overall cloudier and colder conditions than Viking encountered two decades ago.

"Because Pathfinder uses the atmosphere to decrease its velocity for landing, and because the lander and rover are solar-powered, understanding the state of the atmosphere prior to landing is important," said Dr. Matthew Golombek, Pathfinder project scientist at NASA's Jet Propulsion Laboratory, Pasadena, CA.

"On July 4, Mars Pathfinder will enter the atmosphere directly from approach and slow itself behind an aeroshell with a parachute, small solid rockets and giant airbags. The lander carries a small rover to explore the surface and investigate the kinds of materials present. Hubble images of Mars are helping us to adjust our flight path for landing and effectively plan surface operations," said Golombek.

-more-

"It's not the dusty Mars of the Project Viking days (mid 1970s to early 1980s) or the habitable oasis of science fiction stories," says Todd Clancy of the Space Science Institute in Boulder, CO. "We're finding a Mars that's colder, clearer, cloudier. Hubble is rapidly changing our view of Mars' environment. The planet's weather apparently has a flip-side to it."

Hubble's findings also offer new insights into the differences and similarities of weather on the other terrestrial planets. "The planets are similar in many important ways, so the very major differences between them are interesting from a viewpoint of understanding meteorology better," said team leader Phil James of the University of Toledo in Ohio. "Hubble is allowing us to look at Mars in ways never before seen."

In September, NASA's Mars Global Surveyor will skim across the upper martian atmosphere to slow down by friction and enter orbit around the red planet. Atmospheric density is a key factor in precisely executing this complex and delicate aerobraking maneuver. Hubble is ideal for tracking regional dust storms which could pose a threat to Surveyor by drastically changing the planet's air density. Such storms can cause a tenfold increase in the martian atmosphere's drag at 60 miles above the surface.

Comparing the appearance of Mars to that in earlier spacecraft observations, Hubble has found some areas of the martian surface that have been changed dramatically by wind-blown dust. The most prominent example is the "classic dark feature" called Cerberus, which is roughly the size of California (800 by 250 miles). This feature has been seen as a low albedo (dark) region by ground-based telescopic observers since early this century, and was studied in detail by the Mariner 9 and Viking orbiters in the 1970s.

In Hubble's view, only three dark splotches remain, probably related to dark sand being carried out of craters by the wind. The astronomers think that dust storms in the region have covered the formerly dark surface with bright dust, effectively erasing Cerberus from the map.

Hubble is ideally suited for long-term study of Mars. When Mars has been closest to Earth, Hubble has resolved surface details as small as 25 miles across. This allows astronomers to track subtleties in the shifting cloud patterns and periodic dust storms. This planet-wide "weather satellite" view is complementary to the close-up views which will be provided by Mars Pathfinder and Mars Global Surveyor.

The Space Telescope Science Institute is operated by the Association of Universities for Research in Astronomy, Inc. (AURA), for NASA, under contract with the Goddard Space Flight Center. The Hubble Space Telescope is a project of international cooperation between NASA and the European Space Agency (ESA).

EDITOR'S NOTE: Images to accompany this release are available to news media representatives by calling the Headquarters Imaging Branch on 202/358-1900. NASA Photo numbers are:

Color:	Mars Clouds	97-HC-315
Color:	Mars N. Pole	97-HC-316
Color:	Mars 4 Sides	97-NC-317

-more-

Image files in GIF and JPEG format and captions may be accessed on Internet via anonymous ftp from oposite.stsci.edu in /pubinfo.

	GIF	JPEG
PRC97-15a Mars Clouds	gif/marsbwc.gif	jpeg/marsbwc.jpg
PRC97-15b Mars N. Pole	gif/marsnpc.gif	jpeg/marsnpc.jpg
PRC97-15c Mars 4 Sides	gif/mars4op.gif	jpeg/mars4op.jpg

Higher resolution digital versions (300 dpi JPEG) of the release photographs are available in /pubinfo/hrtemp: 97-15a.jpg (color), 97-15b.jpg (color) and 97-15bbw.jpg (black & white), and 97-15c (color) and 97-15cbw.jpg (black & white).

GIF and JPEG images, captions and press release text are available via the World Wide Web at

http://oposite.stsci.edu/pubinfo/PR/97/15.html and via links in:

http://oposite.stsci.edu/pubinfo/Latest.html

or

http://oposite.stsci.edu/pubinfo/Pictures.html

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

May 19, 1997

Michael Braukus
Headquarters, Washington, DC
(Phone: 202/358-1979)

Linda Copley
Johnson Space Center, Houston, TX
(Phone: 281/483-5111)

Lori Rachul
Lewis Research Center, Cleveland, OH
(Phone: 216/433-8806)

Rob Whitehouse
The Cleveland Clinic, Cleveland, OH
(Phone: 216/444-8927)

RELEASE: 97-101

NASA AWARDS GRANT TO CLEVELAND CLINIC TO STUDY THE EFFECTS OF SPACE FLIGHT ON ASTRONAUTS' HEARTS

In preparation for an inhabited International Space Station at the end of this century, The Cleveland Clinic and NASA will study ways to monitor the effects of long-term space flight on the human heart and develop conditioning regimens to counteract those effects.

This morning at The Cleveland Clinic Heart Center, NASA Administrator Daniel S. Goldin and U.S. Representative Louis Stokes announced a two-year, $4 million grant to support the research and development of a digital echocardiography lab at The Clinic.

"We know that astronauts who spend longer periods of time in space experience cardiovascular 'de-conditioning.' They return to Earth weakened and with low blood pressure, less blood volume, and a loss of tone to their blood vessels," said James D. Thomas, M.D., F.A.C.C., director of Cardiovascular Imaging at The Cleveland Clinic. "However, we don't know why this happens and if the heart itself is weakened. Whether people are going to live in space stations or embark on long-term missions to other worlds, we must better understand and then counteract this de-conditioning process."

"This Cooperative Agreement is the result of the vision Congressman Louis Stokes had that prompted NASA to explore the capabilities of The Clinic, and we're glad we did," said Daniel S. Goldin, NASA's administrator. "It partners the expertise of The Clinic and the

-more-

Johnson Space Center to enable planned human space endeavors and to improve the quality of life on Earth."

Digital echocardiographic equipment will be on the Space Station when it is operational. Echocardiography is more practical for life in space than other imaging techniques, such as magnetic resonance imaging, because it requires less power, is noninvasive, is small and versatile, and is not magnetic or radioactive, said Dr. Thomas.

Before the station is operational, researchers at the Cleveland Clinic and NASA must:

- develop methods of compressing the digital data from the echocardiogram so it can be quickly and clearly relayed to physicians on Earth;
- train astronauts and NASA personnel to perform the echocardiograms and develop protocols for using the equipment in outer space; and
- better understand the effects of weightlessness on the heart and enact a conditioning regimen for astronauts in space.

"The digital echocardiography lab at The Clinic will allow physicians here to view astronauts' heart function, make diagnoses, and prescribe a course of action. In a sense, it'll be our first extraterrestrial house call," said Dr. Thomas.

The results of this collaborative project will have an impact on health care on Earth. For example, Dr. Thomas explained, the data compression techniques will further enhance the growing field of telemedicine by allowing for the transmission of clearer images between sites. The Cleveland Clinic currently uses telemedicine technology to link medical specialists in Cleveland to patients as near as The Clinic's suburban family health centers and as far away as the Middle East and Central America.

"In addition, all of this new imaging technology will help us better study the function of the heart and detect previously unseen leakages through heart valves and subtle abnormalities that can lead to congestive heart failure," said Dr. Thomas. "Three-dimensional echocardiography soon will be the norm, and thanks to this cooperative agreement with NASA, we'll be at the leading edge of it."

This is not the first such cooperative effort between The Cleveland Clinic and NASA. In 1995, they announced a three-year pact to collaborate on a number of research projects that will benefit both the space program and the general public. In one of those projects, researchers also are focusing on the health effects of weightlessness on astronauts, specifically on how it causes a degeneration of bone in the feet and lower legs. There, too, researchers are developing conditioning exercises to stimulate bone growth in outer space.

- end -

News Release

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release

Dwayne Brown
Headquarters, Washington, DC
(Phone: 202/358-1726)

May 19, 1997

Kirsten Williams
Dryden Flight Research Center, Edwards, CA
(Phone: 805/258-2662)

RELEASE: 97-102

NEW NASA FACILITY TO REDUCE CHEMICAL WASTES; MAY PROVIDE BETTER STORAGE FOR HAZARDOUS MATERIALS

NASA today unveiled a new facility -- using readily available off-the-shelf components -- that will help reduce chemical wastes, and the technology could be applied in constructing similar facilities throughout the country for better storage of hazardous materials.

Called the Chemical Crib, NASA's Dryden Flight Research Center, Edwards, CA, unveiled the facility that will help reduce the center's chemical wastes by 50 percent in three years.

According to Hazardous Materials Officer John L. Torres, Dryden currently spends about $90,000 per year to dispose of waste. That's down from $310,000 a few years ago. "For every dollar spent to buy chemicals, we spend three dollars to dispose of them," Torres said. "One of the biggest costs involved in waste management is not weight but volume, because waste-disposal space is so precious." Thus, reducing the volume of waste is a key component of Dryden's environmental program.

The facility is a specially designed building that will serve as a central clearinghouse for all aircraft-related chemicals at Dryden, while providing a safe environment for storage and handling of potentially hazardous chemicals. The chemicals will be stored in off-the-shelf lockers that are ventilated and have their own spill-containment systems, heating and cooling regulators, and sniffers to detect spills and fires within them.

Aside from the Chemical Crib itself, three other off-the-shelf devices located in the Crib promise to reduce the volume of waste chemicals Dryden creates. The first is a still that cooks down photographic waste chemicals into a one- or two-pound sludge, reducing the amount of waste by 95 percent. A second still purifies used cleaning solvents, so they can be reused. A large waste compactor, called a "Rampactor," compresses wastes, allowing more to fit into a drum.

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Aircraft maintenance chemicals like lubricants, solvents and cleaning agents typically are sold in bulk quantities to cut down on costs. In the past, each research aircraft crew at Dryden kept its own supply of bulk chemicals, many of which the crew used infrequently. This new facility coordinates and consolidates Dryden's chemical supply, reducing waste.

The Chemical Crib will work on a library-like system -- aircraft maintenance personnel will use a bar code affixed to their badges to "check out" small quantities of chemicals they need to maintain Dryden's research aircraft and return them by the end of the day.

By scanning a person's badge, personnel in the chemical crib will know where the maintenance crew member works, whether the employee is authorized to use the chemical he or she is checking out and what kind of training he or she has received in working with that chemical. Chemicals will be weighed when they are checked out and weighed when returned to determine how much has been used. This information will be transmitted electronically to the Edwards Air Force Base Environmental Office, where it will become part of Edwards' annual report to the Environmental Protection Agency.

The Chemical Crib is only one of several initiatives Dryden's Safety, Health and Environmental Office is making to reduce waste at Dryden, an effort that will not only benefit the environment, but the center's budget as well.

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For Release

May 19, 1997

Debra J. Rahn
Headquarters, Washington, DC
(Phone: 202/358-1778)

Eileen Hawley
Johnson Space Center, Houston, TX
(Phone: 281/483-5111)

RELEASE: 97-103

ASTRONAUT SHANNON LUCID RECEIVES RUSSIAN ORDER OF FRIENDSHIP MEDAL

Astronaut Shannon Lucid received the Order of Friendship medal from Russian President Boris Yeltsin during a ceremony at the Kremlin honoring Russian Cosmonauts and international astronauts who have flown on the Russian space station Mir in 1996.

The Order of Friendship medal is one of the highest Russian civilian awards and the highest award that can be presented to a non-citizen.

Dr. Lucid spent a U.S. record of 188 days in space last year. She was launched to Mir on the Space Shuttle Atlantis (STS-76) on March 22, 1996, and returned to Earth on Atlantis (STS-79) on September 26, 1996.

Lucid was selected as an astronaut in 1978, the first astronaut class to include women to train for Space Shuttle missions. Lucid has flown on five space missions including her Mir mission. Dr. Lucid holds pilot ratings in commercial, instrument and multi-engine aircraft.

-end-

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National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release

Sarah Keegan
Headquarters, Washington, DC
(Phone: 202/358-1600)

May 20, 1997

RELEASE: 97-104

IMAX TO DOCUMENT SPACE STATION ASSEMBLY IN 3-D

The historic, on-orbit construction of the International Space Station will be documented in 3-D by the Imax Corporation in a large-format (70-mm) feature film to be seen around the world.

This will be the first 70-mm space film to be captured in 3-D, a breakthrough made possible by Imax's current development of a 3-D movie camera that will meet the exacting requirements and strict limitations of flying on spacecraft. The film also will be distributed in Imax's 2-D format.

"Our astronauts have said that previous Imax films are the closest thing to actually being in space," NASA Administrator Daniel S. Goldin said. "Capturing the assembly of the International Space Station in this realistic and compelling format will help NASA share this experience with the public. After all, the station belongs to the public, and they have a right to watch it become reality."

The feature film will be made under a Space Act Agreement between NASA and Imax. NASA will own the copyright on all film footage shot in space under the agreement. The agency, in turn, has granted Imax a limited license to create a large-format feature film using the footage. All of the footage eventually will be made available publicly. Meanwhile, NASA retains the right to disseminate, at any time, still photos and videotape segments made from the 70-mm footage.

Under previous Space Act Agreements, Imax has produced three documentaries about the space program: "The Dream is Alive," "Blue Planet" and "Destiny in Space." Collectively, these films have been viewed by more than 60 million people and still are being shown across the United States and internationally. The announcement of the International Space Station film was made in conjunction with today's premiere in Washington, DC, of a fourth Imax space film, "Mission to Mir."

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"Mission to Mir" tells the story of the Space Age relationship between the United States and Russia, beginning with fierce Cold War competition and leading to today's cooperative space program with Russia, including the docking missions between the Space Shuttle and Space Station Mir. The footage from those docking missions--part of the ongoing "Phase One" program that will pave the way for U.S.-Russian cooperation on the International Space Station -- was obtained by Imax under contract to NASA and is the centerpiece of the newly released feature film.

The International Space Station is a partnership of 15 countries, including the United States, Russia, Canada, Japan and eleven member nations of the European Space Agency. On-orbit assembly is scheduled to begin with the launch of the first element by October 1998, and will be completed by 2002.

NASA will acquire images of the assembly process in other, non-Imax formats--including television, videotape and still photos--and disseminate them publicly as soon as they are available.

There are now 153 Imax theaters in 22 countries, including 74 in the United States. Twenty-nine of the theaters are capable of showing 3-D films.

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News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

Dwayne Brown
Headquarters, Washington, DC
(Phone: 202/358-1726)

For Release

May 20, 1997

Mike Mewhinney
Ames Research Center, Mountain View, CA
(Phone: 415/604-3937)

RELEASE: 97-105

NASA TECHNOLOGY SPAWNS NEW CIVILIAN TILTROTOR AIRCRAFT

After 20 years of research and development, an aircraft known as the tiltrotor, which combines the speed and range of a turboprop airplane with the vertical takeoff and landing capability of a helicopter, is poised to enter commercial service.

NASA's Ames Research Center, Mountain View, CA, which manages NASA's Short Haul Civil Tiltrotor program, will look back on 20 years of development during a special program there, celebrating the 20th anniversary of the first flight of the XV-15 Tiltrotor Research Aircraft, on Thursday, May 22 starting at 11:30 a.m. EDT in the Main Auditorium (N-201). Former NASA Deputy Administrator Dr. Hans Mark will discuss "The Tiltrotor Story: A Classic American Technology Development" from noon until 1 p.m. EDT, followed by tours of key tiltrotor research facilities from 1:30 p.m. to 3 p.m. EDT. Media are invited to attend.

After pioneering work in the past, Ames is continuing its work on the tiltrotor concept with studies on the development of a 40-passenger civil tiltrotor. A 1995 Department of Transportation study concluded that a new air transportation system based on civil tiltrotor technology could be created and that a 40-passenger civil tiltrotor is feasible technically, economically and environmentally.

In July 1999, Bell Helicopter Textron Inc., Forth Worth,TX, and Boeing Defense and Space Group's Helicopters Division, Philadelphia, PA, plan to conduct the first flight of the nation's first civilian tiltrotor, the Bell-Boeing 609, a nine-passenger executive transport aircraft. The company is currently building the world's first production tiltrotor, the V-22 Osprey, a military aircraft that will carry 24 combat-ready troops. Bell-Boeing estimates a domestic market of about 1,000 aircraft for the 609 over the next 20 years.

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In addition to the V-22 and 609, Sikorsky Aircraft Corp., a subsidiary of United Technologies Corp., Stratford, CT, is actively pursuing the technology for the next generation of tiltrotors, a variable-diameter tiltrotor, which could further develop the tiltrotor's capability to match those of both a helicopter and a turboprop airplane. Both the 609 and V-22 are direct descendants of the XV-15 Tiltrotor Research Aircraft, developed under a joint NASA/Army/Bell program at Ames.

"The XV-15 was the proof-of-concept vehicle for tiltrotor aircraft," said William J. Snyder, manager of the Advanced Tiltrotor Transport Technology Office at Ames. "The XV-15, which is still flying at Bell Helicopter Textron's flight test center in Arlington, TX, established the technology database for development of the world's first production tiltrotor, the Bell-Boeing V-22 Osprey and the Bell-Boeing 609," Snyder said. "It's the single-most important aeronautical development fully attributable to Ames."

Tiltrotor technology, as exemplified by the XV-15, has been one of the most successful aeronautics research programs in NASA's history. "The XV-15 research aircraft's research contributions did not end with the initiation of the V-22; it continues today to be the primary civil testbed for flight evaluation of new tiltrotor technology, almost 20 years after its first flight," Snyder said.

The XV-15 combines standard aircraft cruise flight with vertical takeoff and landing (VTOL) and short takeoff and landing (STOL) capabilities. A unique feature of the XV-15 are the two large, three-bladed proprotors mounted at the tips of the wings. For takeoff, the proprotors and their engines are rotated straight up, enabling the aircraft to lift off vertically, like a helicopter. Once off the ground, the proprotors and engines rotate forward like a conventional aircraft enabling it to cruise for more than two hours.

These features enable the XV-15 to take off and land at small landing terminals or vertiports rather than at conventional airports and thus give them a significant advantage over turboprop aircraft. "By removing short haul turboprops from the nation's major airports and replacing them with 40-passenger tiltrotor transports, airport congestion and delays could be substantially reduced and substantial savings in time and dollars could be realized by passengers and by the air transport system," Snyder said.

"The XV-15 is much quieter in cruise flight than turboprops. Further, flight research has shown that by converting the proprotors from airplane to helicopter mode in a certain way, the noise footprint of the XV-15 has been found to be reduced by 30 percent over that made by conventional helicopters -- a very significant accomplishment that is important for community acceptance," said John Zuk, national lead for civil tiltrotor studies in the Advanced Tiltrotor Transport Technology Office at Ames.

Twenty years ago this month, the XV-15 successfully completed its first flight at the Bell Helicopter plant in Texas under Ames' management. The aircraft had a 15-year career in flight research at Ames before being sent to Bell in 1994 for further research.

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National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release

May 21, 1997

Dwayne Brown
Headquarters, Washington, DC
(Phone: 202/358-1726)

Michael Mewhinney
Ames Research Center, Mountain View, CA
(Phone: 415/604-3937)

Fred A. Brown
Dryden Flight Research Center, Edwards, CA
(Phone: 805/258-3449)

Dave Phillips
McDonnell Douglas, St. Louis, MO
(Phone: 314/232-1372)

RELEASE: 97-106

REMOTELY-PILOTED TAILLESS AIRCRAFT COMPLETES FIRST FLIGHT

A NASA/McDonnell Douglas remotely piloted, tailless aircraft successfully completed its first flight on May 17 at NASA's Dryden Flight Research Center, Edwards, CA. The lack of vertical tails greatly enhances the stealthy characteristics of the airplane, and holds promise for greater agility than is currently available in existing military fighter aircraft.

Called the X-36, the subscale research aircraft lifted off from Rogers Dry Lake at 7:08 a.m., PDT. The aircraft flew for five minutes and reached an altitude of approximately 4,900 feet. An additional 24 test flights of the X-36 are scheduled at Dryden during the next six months.

"We thought the flight was outstanding; we are beginnning to show what the fighter aircraft of the future will look like," said Rod Bailey, X-36 program manager. When we saw this airplane lift off, we saw the shape of airplanes to come."

NASA's Ames Research Center, Moffett Field, CA, leads the X-36 program, and has technical responsiblity for continued development of some of the critical technologies needed for future tailless, stealthy fighter aircraft.

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There are two 28-percent-scale X-36s, which are remotely piloted jets built by the McDonnell Douglas Corporation's Phantom Works division in St. Louis, MO, and are designed to fly without the traditional vertical and horizontal tails found on most aircraft. Each aircraft measures 18 feet long, 3 feet high, has a 10-foot wing span, and weighs 1,250 pounds. Each aircraft is powered by a Williams Research F112 turbofan engine that provides 700 pounds of thrust.

The X-36 aircraft are remotely controlled by a pilot in a ground station cockpit, complete with a heads-up display . The pilot-in-the-loop approach eliminates the need for expensive and complex autonomous flight control systems. The design reduces weight and drag of the aircraft and explores new flight control technologies. The aircraft use split ailerons to provide yaw control, as well as raising and lowering in a normal fashion to provide roll control. The X-36 also incorporates a thrust vectoring system.

"The flight control system functioned flawlessly and we look forward to subsequent flights to demonstrate the full range of manuverability of the aircraft," said Mark Sumich, X-36 project manager.

"We knew within five to ten seconds into the flight that we had a good flying airplane," said Gary Jennings, McDonnell Douglas X-36 program manager. "Flying in a simulator is one thing, but until you actually fly the airplane, you don't really know how it will handle. Today we found out that it handled extremely well."

NASA Ames and McDonnell Douglas developed the technologies required for a tailless fighter beginning in 1989. In 1993, McDonnell Douglas proposed the remotely piloted aircraft technology demonstration to validate the technologies in a real flight environment. In 1994, McDonnell Douglas began fabrication of the two aircraft in their rapid prototyping facility in St. Louis. The project was jointly funded under a roughly 50/50 cost-sharing arrangement between NASA and McDonnell Douglas. The combined program cost for the development, fabrication, and flight testing of the two prototype aircraft is approximately $20 million.

"The first flight went very well; it was just textbook perfect," said Larry Walker, X-36 Project pilot. "It was a nice takeoff and the handling was great. I knew instantly that it was a nice flying airplane. I see no obstacles in the future for this type of technology."

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Photos are available from NASA Ames Research Center's Public Affairs' homepage at URL:

http://ccf.arc.nasa.gov/dx

and also are available from the NASA Dryden Photo Archive on the World Wide Web at URL:

http://www.dfrc.nasa.gov/PhotoServer/photoserver.html

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National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Jim Cast
Headquarters, Washington, DC
(Phone: 202/358-1779)

May 22, 1997

Dom Amatore
Marshall Space Flight Center, Huntsville, AL
(Phone: 205/544-0031)

Baron Beneski
Orbital Sciences Corp., Dulles, VA
(Phone: 703/406-5528)

RELEASE: 97-107

X-34 SYSTEMS DESIGN FREEZE COMPLETED

Government and industry managers yesterday successfully completed a three-day systems design freeze of X-34, the next technology demonstrator vehicle in NASA's Reusable Launch Vehicle stable.

X-34, a reusable, suborbital, air-launched vehicle, will fly at speeds approaching Mach 8 (eight times the speed of sound) at altitudes up to 50 miles to continue demonstrations of new, reusable launch vehicle technologies aimed, ultimately, at dramatically reducing the cost of transporting payloads into space.

The review, conducted at Orbital Sciences Corporation in Dulles, VA, essentially anchors the design of X-34 systems -- for example, structures, guidance, navigation and control, avionics, thermal protection systems and main propulsion systems -- that will allow the program to proceed with fabrication and manufacturing of these systems. Initial flights, scheduled for launch and landing within air space at the White Sands Missile Range, NM, will begin in late 1998. Up to 25 flights within a year's time are scheduled; some also will take place in Florida to demonstrate subsonic landing and thermal protection system performance through inclement weather conditions.

X-34 bridges the gap between earlier subsonic Clipper Graham (DC-XA) flights in 1996, and the larger and higher performance X-33 Mach 15 demonstrator, which will

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begin flights in early 1999. The winged, reusable, single-stage X-34 vehicle -- propelled by a kerosene/liquid oxygen engine developed, tested and provided by NASA -- will demonstrate key technologies, including composite primary and secondary airframe structures; cryogenic insulation and propulsion system elements; advanced thermal protection systems and materials; low cost avionics, including differential Global Positioning and Inertial Navigation Systems; as well as key operations technologies such as integrated vehicle health-monitoring and automated checkout systems.

Six NASA Centers, Department of Defense installations (White Sands Missile Range and Holloman Air Force Base) and an industry team led by the prime contractor, Orbital Sciences Corporation, are playing key roles in the development and eventual flight testing of the X-34 technology testbed demonstrator. The program is managed by the Marshall Space Flight Center, Huntsville, AL.

- end -

Note to Editors: A high-resolution X-34 photo is available via the Internet at: http://rlv.msfc.nasa.gov. Additional photo requests may be directed to NASA Headquarters Imaging Branch at 202/358-1900, or the Marshall Space Flight Center at: 205/544-0031.

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Washington, DC 20546
(202) 358-1600

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May 22, 1997

Douglas Isbell
Headquarters, Washington, DC
(Phone: 202/358-1753)

Catherine E. Watson
Langley Research Center, Hampton, VA
(Phone: 757/864-6122)

Ann C. Gaudreaux
Langley Research Center, Hampton, VA
(Phone: 757/864-8150)

RELEASE: 97-108

NASA SOLAR ENERGY DATA AIDS SOLUTION TO AFRICAN HUNGER

In refugee camps in East Africa, women and children often must search for hours to find enough firewood to cook for their families. In some African cities, the urban poor spend more than half their annual income on cooking fuel.

To help solve this problem, volunteers are using data generated by NASA's Mission to Planet Earth program to help the people of East Africa learn to cook using solar energy. "We have found the NASA Surface Solar Energy data set to be a wonderful resource, providing reliable data for any location on Earth," said Jay Campbell, a director for the non-profit Solar Cookers International (SCI), Sacramento, CA, a group that promotes the use of solar cooking technology worldwide.

SCI manages solar cooking training in eight refugee camps and less developed areas, and responds to requests for information from individuals worldwide. According to Campbell, the NASA Surface Solar Energy (SSE) data set has become invaluable to SCI in choosing sites where solar cooking will be most useful to the local population. "This quality of information is simply unavailable from other sources, and allows us to make better decisions for our consultations and project plans," he said.

In addition to being a relatively cheap heat source, solar cooking reduces smoke, air pollution and deforestation; is clean, convenient and safe around children; and also can be used to pasteurize drinking water to help prevent disease.

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"Unfortunately, about 40 percent of the people in the world have no electricity," said Dr. Charles Whitlock, a senior research scientist at NASA's Langley Research Center, Hampton, VA, who led the team that developed the SSE data set. "We hope that the data can be used to improve designs of solar-assisted power systems to give electricity to some of these people."

According to Whitlock, the present SSE data also are expected to allow more efficient design of solar-assisted electricity systems for homeowners, communications stations, oil platforms and weather-monitoring instruments in remote locations of the world.

"This type of satellite data should have a very wide range of energy and agricultural applications over the long term," Whitlock added. "The cost of solar cells has dropped from $100 per watt to $2 per watt since 1970, and it's expected to drop to one-third the current price by 2010," he said.

Newly accessible via the Internet, the SSE data set is available for anyone to use. Users need only enter their latitude and longitude to receive a one-page printout on the available solar energy in their area. The global data set, a synthesis of information from several weather satellites, contains 52 monthly averages, in comparison to traditional individual measurements from isolated surface sensors.

The data set can be accessed through the NASA Langley Distributed Active Archive Center at URL:

http://eosweb.larc.nasa.gov/DATDOCS/Surface_Solar_Energy.html

The new Internet site is designed to accommodate a range of computer system capabilities. For those users with more advanced systems, text files, color and contour plots on a global scale also are available.

"The release of this data to the Internet will not only help us answer questions faster, but will allow more specific advice to be given," said SCI's Campbell. "Solar cooking provides tremendous health, environmental and financial benefits to those who can use it. Better identification of target areas will help spread this powerful tool farther and faster than before."

As NASA's Mission to Planet Earth progresses into the next century, Langley researchers will take advantage of all the latest data. "Working with the energy and agricultural communities, we expect to create an improved data set that accounts for smoke from biomass burning, and to add quantities that are not included in the first data set," Whitlock said.

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"The additional quantities should enable new commercial applications in both the energy and agricultural industries. We also expect to use measurements from the Clouds and the Earth's Radiant Energy System instrument to create a data set that has a higher resolution," Whitlock added. This instrument is scheduled for launch in early November aboard the joint U.S.-Japanese Tropical Rainfall Measuring Mission.

The SSE data set was created by Langley and Analytical Services and Materials, Inc., Hampton, VA, under the sponsorship of NASA's Mission to Planet Earth enterprise. This office leads a long-term, internationally coordinated research effort to study the Earth as a global environmental system.

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Douglas Isbell
Headquarters, Washington, DC
(Phone: 202/358-1753)

May 23, 1997

RELEASE: 97-109

FIRST MISSION TO PLANET EARTH EDUCATIONAL GRANTS AWARDED

NASA has selected 18 proposals for funding in response to the Agency's first NASA Research Announcement (NRA) specifically focused on Earth system science education.

The announcement in fall 1996 was designed to address two primary objectives. The undergraduate student support will provide opportunities for undergraduates to participate in Earth system science research projects. The pre-service teacher enhancement proposals will provide teachers in training and some current educators with an opportunity to become more familiar with Earth system science.

"These first solicited educational grants by NASA's Mission to Planet Earth enterprise, developed in conjunction with NASA's Education Division, underscore our commitment to helping students and teachers develop a more complete understanding of the Earth and its land, oceans and atmosphere," said William Townsend, Acting Associate Administrator for the Office of Mission to Planet Earth. "We plan to learn from the results of these innovative projects in the years ahead, and infuse future efforts with research data from the orbiting Earth Observing System, aircraft flights and ground-based measurements."

A total of 61 proposals from more than 50 different institutions were received in response to this NRA (NRA-96-MTPE-07), "Opportunities to Participate in NASA's Mission to Planet Earth Education Program."

Using a peer-review process that included both science and education professionals, 18 proposals were selected for total funding of nearly $700,000 per year for the next three years. This group includes twelve pre-service teaching proposals and six undergraduate student support proposals as listed below.

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Pre-Service Teacher Enhancement

Planet Earth Workshops for Teacher of Physical Science
University of New Orleans — PI - Dr. John J. Sullivan
New Orleans, LA 70148-2840

CISAT Pre-Service Teacher Enhancement Workshop
James Madison University — PI - Dr. James L. Barnes
Harrisonburg, VA 22807

Umass Planet Earth Education Program (Planet Earth)
University of Massachusetts Amherst — PI - Dr. Morton M. Sternheim
Amherst, MA 01003

Introductory Training for Pre-Service Teachers in Earth System Science
University of Texas El Paso — PI - Dr. Vicki Harder
El Paso, TX 79968

Earthworks: Educating Teachers in Earth System Science
University of Colorado Boulder — PI - Dr. Hartmut Spetzler
Boulder, CO 80309-0216

Pre-Service K-12 Teacher Workshops for Earth Systems Science & Policy
California State University Monterey Bay — PI - Dr. Jack F. Paris
Seaside, CA 93955-8001

Mission Possible: Earth System Science, the Curriculum, and You
Augustana College — PI - Dr. Valerie K. Olness
Sioux Falls, SD 57197

Concepts and Pedagogical Strategies in Earth System Science Education for K-12 Teachers of Science and Environmental Education
West Chester University — PI - Dr. Richard Busch
West Chester, PA 19383

Pre-Service Earth Science Training Opportunity (PESTO)
Aspen Global Change Institute — PI - Dr. John Katzenberger
Aspen, CO 81611

A Cross-Disciplinary Literacy Course on Earth System Science for Teachers in the 21st Century
University of Pittsburgh — PI - Dr. Hssad A. Panah
Bradford, PA 16701-2898

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Pre-Service and In-Service Teacher Enhancement Using a Space Camera
University of Texas Austin — PI - Dr. Wallace Fowler
Austin, TX 78759-5321

A Summer of Seasons
Norfolk State University — PI - Dr. S. Raj Chaudhury
Norfolk, VA 23504

Higher Education Student Support

Advanced Undergraduate Research Using Optical Radiation in the Atmosphere (AURORA)
Hampton University — PI - Dr. Doyle A. Temple
Hampton, VA 23668

UCSB Earth System Science Undergraduate Summer Research Program
University of California Santa Barbara — PI - Dr. Catherine Gautier
Santa Barbara, CA 93106

Undergraduate Internships in Earth System Research at Biosphere 2 Center
Columbia University — PI - Dr. W. S. Broecker
Palisades, NY 10964
Oricle, AZ 85623

Earth Systems Field Research Experience for Undergraduates
Foundation for Glacier & Environ Research — PI - Dr. Maynard M. Miller
University of Idaho
Moscow, ID 83844

OUR Earth: Opportunities for Undergraduate Research in Earth System Science
University of Washington — PI - Dr. Janice DeCosmo
Seattle, WA 98195

Research Experience in Earth System Science
Norfolk State University — PI-Dr. Waldo J. Rodriguez
Norfolk, VA 23504

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May 23, 1997

Douglas Isbell
Headquarters, Washington, DC
(Phone: 202/358-1753)

Jane Platt
Jet Propulsion Laboratory, Pasadena, CA
(Phone: 818/354-5011)

RELEASE: 97-110

GALILEO RETURNS NEW INSIGHTS INTO CALLISTO AND EUROPA

Jupiter's icy moon Europa has a metallic core and layered internal structure similar to the Earth's, while the heavily cratered moon Callisto is a mixture of metallic rock and ice with no identifiable central core, according to new results from NASA's Galileo mission.

In addition, recent plasma wave observations from Galileo show no evidence of a magnetic field or magnetosphere around Callisto, but do hint at the prospect of a tenuous atmosphere.

These peer-reviewed findings, reported in today's issue of Science magazine and the May 16 issue of Nature magazine, are based on data gathered during Galileo's Nov. 4, 1996, flyby of Callisto and its Europa encounters on Dec. 19, 1996, and Feb. 20, 1997.

"Before Galileo, we could only make educated guesses about the structure of the Jovian moons," said Dr. John Anderson, a planetary scientist at NASA's Jet Propulsion Laboratory (JPL), Pasadena, CA. "Now, with the help of the spacecraft, we can measure the gravitational fields of the satellites and determine their interior structure and density. We can determine how the matter is distributed inside."

While scientists use seismic waves to study Earth's interior, Galileo performs remote studies of Jupiter's moons by measuring small changes in the spacecraft's trajectory as it passes each body.

"These new results from the gravity data are very consistent with the idea of subsurface oceans on Europa," Anderson said. "We know that Europa has a very deep layer of water in some form, but we don't yet know whether that water is liquid or frozen."

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In an article appearing in the May 23 edition of Science, Dr. Margaret Kivelson, principal investigator for Galileo's magnetometer, reports that during its December 1996 pass by Europa, the magnetometer detected what she described as "a substantial magnetic signature," and also found that Europa's north magnetic pole is pointed in an odd direction. Based on these observations, Kivelson, a professor at the University of California at Los Angeles, said Europa may have a magnetic field about one-quarter the strength of Ganymede's magnetic field.

Although the magnetometer was malfunctioning during Galileo's Europa flyby in February 1997, Kivelson said the problem is corrected and the device is expected to return valuable data during its upcoming Europa flybys. The next Europa encounter is scheduled for November, with a series of flybys planned during a two-year Galileo extended mission.

Galileo's findings on the Jovian moon Callisto revealed a much different structure than Europa. Scientists believe that because Callisto is the Galilean moon located farthest from Jupiter, it was never subjected to the same gravitational pull as the inner moons and, therefore, never experienced enough heating to form different layers.

"Callisto had a much more sedate, predictable and peaceful history than the other Galilean moons," Anderson explained, "and, therefore, it is a more typical solar system object." The findings indicate Callisto has no core, but instead has a homogeneous structure, with 60 percent of its ingredients being rock, including iron and iron sulfide, and 40 percent made of compressed ice.

Dr. Donald Gurnett, principal investigator for the Galileo spacecraft's plasma wave instrument, said the instrument displayed a very minor response from Callisto and, consequently, showed no evidence of a magnetic field or magnetosphere. The latest issue of Nature magazine contains these findings, as well as supportive data from magnetometer studies of Callisto, as reported by Dr. Krishan Khurana of UCLA.

However, Gurnett added, "There is some evidence of a plasma source on Callisto, which might indicate a very tenuous atmosphere." Gurnett is a professor at the University of Iowa at Iowa City.

The Galileo spacecraft was launched in October 1989 and entered orbit around Jupiter on Dec. 7, 1995. The Galileo mission is managed by JPL for NASA's Office of Space Science, Washington, DC.

Images and other data from Galileo are posted on the Galileo mission home page on the World Wide Web at URL: http://www.jpl.nasa.gov/galileo.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

May 27, 1997

Dwayne Brown
Headquarters, Washington, DC
(Phone: 202/358-1726)

H. Keith Henry
NASA Langley Research Center, Hampton, VA
(Phone: 757/864-6120)

Sally Koris
TRW Space & Electronics Group, Redondo Beach, CA
(Phone: 310/812-4721)

RELEASE: 97-111

WEATHER-PIERCING CAMERA MAY REDUCE AIR TRAFFIC DELAYS

Air traffic delays due to poor visibility caused by weather can be virtually eliminated if technology being developed by U.S. industry and government looks as good in the air as it does on the ground.

NASA's Langley Research Center, Hampton, VA, is working with a consortium led by TRW Space & Electronics Group, Redondo Beach, CA, that is preparing to demonstrate in flight a weather-piercing camera that has allowed researchers to see through fog, smoke and clouds. System checkout will begin later this month, followed by 60 hours of test and demonstration flights in September.

The camera "sees" in the millimeter wave portion of the electromagnetic spectrum, a portion that is invisible to the human eye. It produces video images that enable a pilot to discern features like runways, obstacles and the horizon.

These features are sufficient to safely land, take off, roll out and taxi at any airline terminal in the country -- not just the three dozen or so major airports that have costly systems to aid in low visibility approach and landings. The camera is a passive sensor that does not emit signals in an airport environment, allowing multiple equipped aircraft to operate simultaneously on the ground without risk of interference.

"This sensor program directly supports NASA's new goal to safely triple capacity at our nation's commercial airports within the next ten years -- regardless of fog, clouds, smoke and dust, or other conditions that normally limit pilot visibility," said Tom Campbell, head of Langley's Electromagnetic Research Branch.

In 1994, the TRW-led Passive Millimeter Wave Camera Consortium was awarded a multi-year, $15 million cost-sharing contract under the Department of Defense Advanced Research Projects Agency's Defense Dual-Use Technology Initiative to adapt this technology to an airborne camera for military and civilian users.

Langley has served as the government's principal representative and is funding the flight test element of the program.

In addition, Langley is performing lab tests to determine which materials are most "invisible" to millimeter waves and, therefore, good candidates for the protective nose radome that will house the camera on the flight test aircraft. The tests also will provide the consortium's radome design team with data about optimum material thicknesses, protection from rain erosion and protection from static build-up.

The aircraft is a one-of-a-kind Air Force C-135-C aircraft nicknamed the "Speckled Trout," to be fitted with the millimeter-wave camera and its new radome this summer. Once installed, the camera will generate video images of the forward scene in low-visibility conditions. These images will be displayed on a see-through heads-up display suspended between the pilot and the windscreen.

The sensor uses a focal plane array of about 1,000 receivers made up of monolithic millimeter wave integrated circuits developed by TRW. Each of these complex circuits, formed on a sliver of gallium arsenide, replaces bulky, heavy and costly components, resulting in a compact device.

"We're very excited about what we have produced under this program," said Dr. Steven Fornaca of TRW, the consortium's program manager. "Based on the images we have acquired under low-visibility conditions, and the quality of the receivers we've developed, we are confident that we are bringing to the aviation market a needed product that can be manufactured efficiently and at low cost."

Other consortium members are McDonnell Douglas, Long Beach, CA.; Honeywell, Minneapolis, MN; Composite Optics Inc., San Diego, CA; NASA Ames Research Center, Mountain View, CA; U.S. Air Force Wright Labs, Dayton, OH; U.S. Air Force Flight Test Center, Edwards Air Force Base, CA; and the U.S. Army Research Lab, Adelphi, MD.

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NOTE TO EDITORS: A photograph is available to news media to illustrate this story by calling the NASA Headquarters Imaging Branch at 202/358-1900. The photo number is:

97-HC-352

News Release

National Aeronautics and
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Washington, DC 20546
(202) 358-1600

For Release

Debra Rahn
Headquarters, Washington, DC
(Phone: 202/358-1639)

May 28, 1997

Jerry Berg
Marshall Space Flight Center, Huntsville, AL
(Phone: 205/544-0034)

RELEASE: C97-d

TELEDYNE BROWN ENGINEERING CHOSEN TO PROVIDE PROPELLANTS, PRESSURANTS AND CALIBRATION SERVICES TO MARSHALL

Teledyne Brown Engineering of Huntsville, AL, has been awarded a contract by NASA's Marshall Space Flight Center, Huntsville, AL, to provide propellants, pressurants and calibration services in support of operations at the center, for a period of up to five years.

If all options are exercised, the contract could be worth approximately $28.9 million.

Services to be provided under the contract are operation and maintenance of propellants and pressurants, which are substances such as nitrogen, hydrogen, helium and oxygen, that are used in conjunction with propulsion testing activities in Marshall's laboratories. The effort also involves operating and maintaining systems at the center for generating, storing and distributing high-purity air, as well as providing instrument calibration services.

The performance-based contract, with provision for performance incentives and deductions, will be divided into a one-year base period and four one-year options that may be exercised at NASA's discretion.

The services to be provided are a continuation of an effort currently being performed under contract by Teledyne Brown Engineering.

Also submitting proposals were United Paradyne Corp., Santa Maria, CA; EG&G Florida, Inc., Cocoa Beach, FL; and General Physics Corp., Columbia, MD.

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News Release

National Aeronautics and
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(202) 358-1600

For Release

May 28, 1997

Douglas Isbell
Headquarters, Washington, DC
(Phone: 202/358-1753)

William A. Steigerwald
Goddard Space Flight Center, Greenbelt, MD
(Phone: 301/286-8955)

RELEASE: 97-112

POLAR SPACECRAFT IMAGES SUPPORT THEORY OF INTERPLANETARY SNOWBALLS SPRAYING EARTH'S UPPER ATMOSPHERE

Images from NASA's Polar spacecraft provide new evidence that Earth's upper atmosphere is being sprayed by a steady stream of water-bearing objects comparable to small comets.

Using Polar's Visible Imaging System (VIS), a research team led by Dr. Louis A. Frank of the University of Iowa in Iowa City has detected objects that streak toward Earth, disintegrate at high altitudes and deposit large clouds of water vapor in the upper atmosphere. Frank's research is being reported in a news briefing at 10 a.m. today at the spring meeting of the American Geophysical Union at the Convention Center in Baltimore, MD.

The incoming objects, which Frank estimates to be the size of a small house, pose no threat to people on Earth, nor to astronauts in orbit. "They break up and are destroyed at 600 to 15,000 miles above the Earth," Frank noted. "In fact, this relatively gentle 'cosmic rain' -- which possibly contains simple organic compounds -- may well have nurtured the development of life on our planet."

"This is an intriguing result that requires further scientific investigation," said Dr. George Withbroe, science director for the Sun-Earth Connection program in NASA's Office of Space Science. "We need to look closely at measurements from other sensors to find out if they see related signatures in the atmosphere, now that we have learned more about what to look for."

The Polar cameras have imaged trails of light in both ultraviolet and visible wavelengths as the objects disintegrate above the atmosphere. Using a filter that detects visible light emitted only by fragments of water molecules, Frank has shown that the objects consist primarily of water.

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"The Polar results definitely demonstrate that there are objects entering the Earth's upper atmosphere that contain a lot of water," commented Dr. Thomas M. Donahue, a noted atmospheric physicist and professor at the University of Michigan in Ann Arbor.

"The images show that we have a large population of objects in the Earth's vicinity that have not been detected before," said Frank, who designed the VIS instrument. "We detect these objects at a rate that suggest Earth is being bombarded by five to 30 small comets per minute, or thousands per day." Comets are known to contain frozen water and are sometimes called "dirty snowballs".

Frank's new observations are consistent with a controversial theory he proposed in 1986 to explain the existence of dark spots, which he termed "atmospheric holes", in images of the sunlit atmosphere of the Earth. He first detected these holes while analyzing data from an ultraviolet imager flown on NASA's Dynamics Explorer 1 spacecraft. He theorized that the holes were caused by the disintegration of small icy comets in the upper atmosphere. The water vapor they produce momentarily absorbs the ultraviolet solar radiation scattered from oxygen atoms in the upper atmosphere, preventing it from reaching his camera and resulting in a dark spot on the image. These holes have diameters of 15 to 25 miles.

His theory of a new class of objects in the Solar System ignited a wide-ranging controversy. Many colleagues discounted the appearance of the holes as an instrumental problem. But the new images from Polar also include observations of atmospheric holes in much greater detail than before, suggesting that they are real. "These results certainly vindicate Lou Frank's earlier observations", said Donahue.

"These remarkable images cap a great first year for Polar," added Dr. Robert Hoffman, Project Scientist for Polar, which is operated and managed by NASA's Goddard Space Flight Center, Greenbelt, MD. "I am pleased that Polar's instruments were able to actually detect these objects streaking towards the Earth and disintegrating into clouds of water vapor. They give scientists a fascinating new and important phenomenon to take into account in theories of Solar System evolution."

Images of the comets and the atmospheric holes can be found on the World Wide Web at the following URL:

http://pao.gsfc.nasa.gov/gsfc/newsroom/flash/flash.htm

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News Release

National Aeronautics and
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Washington, DC 20546
(202) 358-1600

Jim Cast
Headquarters, Washington, DC
(Phone: 202/358-1779)

For Release
May 29, 1997

David Morse
Ames Research Center, Mountain View, CA
(Phone: 415/604-4724)

RELEASE: 97-113

THERMAL MATERIAL PERFORMS WELL DURING FIRST FLIGHT TEST

A new thermal protection material designed to prevent spacecraft from burning up during reentry into Earth's atmosphere performed extremely well during its first flight test. The ultra-high temperature ceramic material may someday revolutionize the approach that engineers take to the design and protection of aerospace vehicles.

A large amount of data on the thermal performance of the new material was collected on May 21 when a Mk 12A reentry vehicle blasted off from Vandenberg Air Force Base, near Lompoc, CA, at 4:27 a.m. EDT aboard a U.S. Air Force Minuteman III missile. The reentry vehicle, equipped with a 0.141-inch radius nose tip made from the new ceramic material, took an approximately 30-minute, 4,200-mile ride. Once out in space, the reentry vehicle was released, returning through Earth's atmosphere at blistering speed to a watery impact in the Kwajalein missile range of the Pacific Ocean. The sharp nose tip was instrumented with five heat sensing devices designed to provide information on how well the new ceramic material stood up to the burning temperatures of reentry. NASA engineers report that data was collected right up to the moment of splashdown.

"This was just the first data-gathering flight test for this new material," said Joan Salute, project manager for the mission located at NASA's Ames Research Center, Mountain View, CA. "However, initial results suggest that it was a complete success. After extensive data analysis, we should have good information on the potential of this ultra-high temperature ceramic material to support a radical new concept in aerospace vehicle design -- the use of hypersonic sharp leading edges."

This first test flight -- authorized only last December -- was accomplished in less than six months at a cost to NASA of $1.1 million. Plans for additional flights currently are under discussion. The potential benefits to be derived from the use of sharp leading-edge designs for spacecraft and transatmospheric vehicles are tremendous. Sharp-body designs offer reduced drag, thereby providing substantial savings in the cost per pound expended to put objects into orbit. In addition, they provide a greatly enhanced lift-to-drag ratio, enabling what is called cross-range capability. This means that spacecraft and transatmospheric vehicles can reenter Earth's atmosphere from any orbit and land at any location, unlike present blunt body vehicles. Finally, sharp leading edges minimize the number of free electrons that interfere with radio frequency transmissions and cause the communications blackout associated with the reentry of blunt body vehicles.

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The history of leading edge design is instructive. In the 1940s, aircraft routinely featured wings with sharp leading edges since that configuration was found to reduce drag at supersonic velocities (above the speed of sound, Mach 1, approximately 740 mph at sea level). However, with the coming of hypersonic flight (Mach 5 and faster) in the 1950s, the buildup of heat on the sharp leading edges of vehicle wings was so severe that available materials tended to burn up and their leading edges became blunted. Engineers took their cue from this natural blunting process in addressing the problem.

"All along, Mother Nature was trying to tell us how to deal with this situation," said Paul Kolodziej, lead engineer for the project at Ames. "Engineers realized that if they blunted the leading edge themselves in the design process, this would move the shock wave created during hypersonic flight forward and out, away from the vehicle, creating an air pocket in front of it." This air absorbs much of the heat associated with reentry, preventing the leading edge from becoming so hot and melting. "Because these new ceramic materials operate at ultra-high temperatures, we can now build sharp leading edges that don't melt during reentry along trajectories such as those flown by the Space Shuttle," Kolodziej said.

Blunt body design remains the norm today. In fact, it was the blunt body concept, originally developed at Ames by the late H. Julian Allen, that enabled development of space vehicles capable of withstanding the rigors of reentry. The problem is that blunt body vehicles have high drag and are not efficient. They therefore require large and expensive propulsion systems that impose a severe penalty in terms of cost, capability and performance. Developing an approach that permits the safe use of sharp leading-edge configurations for vehicles flying at hypersonic speeds holds the promise of yielding huge benefits. The key to achieving that payoff is the development of highly efficient thermal protection materials like those currently being evaluated by NASA engineers.

The ultra-high temperature ceramic material that just completed its first flight test has already proven out in ground-based testing in the arcjet facilities at Ames. In fact, the materials were shown to be very stable at temperatures in the range of 1,700 - 2,800 degrees Celsius (3,092-5,072 degrees Fahrenheit) in the presence of high-velocity dissociated air, such as is encountered during conditions of reentry. They also have been shown to be resistant to thermal shock and fatigue failure and, hence, reliable for repetitive operation and use over multi-mission lifecycles.

The development and testing of the new material is part of a joint program among NASA, Sandia National Laboratories and the US Air Force called Slender Hypervelocity Aerothermodynamic Research Probes, or SHARP. Additional information about the SHARP program can be obtained at the project's Ames web site on the Internet at URL:

http://kauai.arc.nasa.gov/projects/sharp/sharp.html

NASA's participation in the SHARP program is funded by the Headquarters Office of Aeronautics and Space Transportation Technology. The objective of the effort is to demonstrate the viability of sharp leading edges for space vehicles and possible future transatmospheric passenger aircraft that may have the capability to fly out of Earth's atmosphere and into the fringes of space and back. The SHARP program is a key element supporting NASA's overall mission to expand the nation's frontiers and capabilities in the aeronautics and space domain.

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News Release

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

Dwayne Brown
Headquarters, Washington, DC
(Phone: 202/358-1726)

For Release

May 29, 1997

Fred Brown
Dryden Flight Research Center, Edwards, CA
(Phone: 805/258-2663)

RELEASE: 97-114

TESTS BEGUN TO STUDY DECREASE IN AIRCRAFT DRAG; MAY PRODUCE SUBSTANTIAL FUEL COST REDUCTIONS FOR AIRLINES

NASA researchers have begun tests on an experiment they hope will improve the efficiency of commercial aircraft by minimizing aerodynamic drag. This, in turn, could mean a savings of up to $140 million annually in commercial fuel costs.

Drag is the aerodynamic force resulting from air pressure and friction that acts to resist the passage of an aircraft as it flies through the air.

Called the Adaptive Performance Optimization experiment, the tests will obtain data on applying an aircraft's control surfaces in the optimal position to reduce drag. The tests, which began last week, will be conducted on a modified Lockheed L-1011 TriStar by NASA's Dryden Flight Research Center, Edwards, CA.

NASA's Langley Research Center, Hampton, VA, is sponsoring the testing, which is part of the Advanced Subsonic Transport Aircraft Research program led by the Airframe Systems Program Office at Langley.

"A drag reduction of only one percent translates into an equivalent saving in fuel usage and fuel costs, a major factor in airline operations when you improve the efficiency of transport aircraft by minimizing aerodynamic drag," said Dryden engineer Glenn Gilyard, principal investigator and flight-test director for the experiment.

"There are lots of data to indicate that a one percent improvement is achievable," Gilyard said. "The trick is identifying very small changes in drag," he added. Project officials are hoping for drag reductions of up to three percent.

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The modified Lockheed L-1011 TriStar jetliner is operated by Orbital Sciences Corp. of Dulles, VA. The research team plans to fly the aircraft approximately three or four times each year over the next two or three years in both the current and follow-on phases of the experiment. The follow-on phases could incorporate the TriStar's flaps into the system, as well as second-generation computer software using artificial intelligence. Most of the tests will be flown at speeds of about Mach 0.83 and at altitudes of 30,000 to 40,000 feet.

Gilyard pointed out that all aircraft are designed to operate most efficiently at a single point in their flight profile. Unfortunately, they often do not fly at that design point, and therefore fly at reduced efficiency.

"The experiment is designed to improve aircraft performance during a given flight condition, based on real-time in-flight measurements and analysis," Gilyard said.

For the experiment, a team of engineers designed a software program for the aircraft's research computer that reduces aerodynamic drag of the entire aircraft by changing the positions of the aerodynamic control surfaces. The program incorporates data such as airspeed, altitude, engine measurements and other parameters to make instantaneous decisions on adjusting the position of the control surfaces for the greatest aircraft efficiency for each point in the flight profile.

In addition to developing the software, NASA engineers developed flight-research systems that will record test data and will allow on-board flight test engineers to make decisions and analysis of research data while the flights are in progress.

"We are trying to achieve savings based on the difference between what the manufacturer designed the airplane to be and what the airplane actually is," said Gilyard. "The bottom line is how much fuel goes into that airplane over the course of a year. The potential fuel cost savings for a single MD-11 in regular service could be $130,000 per year and for a Boeing 747, the savings could approach $150,000."

These tests mark the beginning of programs that will reflect the enabling technology of one of NASA's major aeronautics goals -- to reduce the cost of air travel by 25 percent within ten years and by 50 percent within 20 years.

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A Photographic image is available to news media to illustrate this release by calling the Headquarters Imaging Branch at 202/358-1900. The photo numbers are:

97-HC-365
97-HC-366

News Release

National Aeronautics and
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Washington, DC 20546
(202) 358-1600

Douglas Isbell
Headquarters, Washington, DC
(Phone: 202/358-1753)

For Release
May 29, 1997

Mary Hardin
Jet Propulsion Laboratory, Pasadena, CA
(Phone: 818/354-5011)

Stephanie Kenitzer
National Oceanic and Atmospheric Administration, Washington, DC
(Phone: 301/713-0622)

RELEASE: 97-115

COMPLEMENTARY SATELLITE MEASUREMENTS SUGGEST EL NINO IS BREWING AGAIN

Simultaneous ocean measurements taken by two orbiting NASA science instruments suggest that another weather-disrupting El Niño condition may be developing in the Pacific Ocean, with the potential of altering global weather patterns next winter.

Sea-surface height measurements taken by the radar altimeter onboard the joint U.S.-French TOPEX/POSEIDON satellite and wind data collected by the NASA Scatterometer on Japan's Advanced Earth Observing Satellite (ADEOS) are being used together for the first time to diagnose changing oceanographic and atmospheric conditions in the tropical Pacific Ocean.

The El Niño phenomenon is thought to be triggered when steady westward blowing trade winds weaken and even reverse direction. This change in the winds allows the large mass of warm water that normally is located near Australia to move eastward along the equator until it reaches the coast of South America. This displaced pool of unusually warm water affects where rain clouds form and, consequently, alters the typical atmospheric jet stream patterns around the world. The change in the wind strength and direction also impacts global weather patterns.

"NSCAT has observed two episodes of the reversal of the trade winds in the western Pacific, one at the end of December and one at the end of February. Both generated warm water masses, called Kelvin waves, that traveled across the Pacific and were measured by TOPEX/POSEIDON," said Dr. Lee-Lueng Fu, TOPEX/POSEIDON project scientist at NASA's Jet Propulsion Laboratory (JPL), Pasadena, CA. "Kelvin waves are often a precursor to a warm state of the tropical Pacific, sometimes leading to an El Niño.

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"Whether an El Niño event will occur cannot be determined by just examining the satellite data," Fu continued. "A computer model that couples ocean-atmosphere data, like the one used by the National Oceanic and Atmospheric Administration (NOAA), is a necessary tool to issue scientifically based predictions. Now, for the first time, both TOPEX/POSEIDON and NSCAT are observing and providing the best, near real-time view of global ocean winds and sea level ever obtained. These observations will help NOAA's model to predict the occurrence of El Niño."

NOAA has issued an advisory regarding the presence of the early indications of El Niño conditions. A number of El Niño forecast activities supported by NOAA indicate the likelihood of a moderate or strong El Niño in late 1997. The forecast model operated at NOAA's National Centers for Environmental Prediction (NCEP) used data collected by the TOPEX/POSEIDON satellite.

"The use of TOPEX/POSEIDON data clearly improved our forecast for the winter of 1996-1997," said Dr. Ants Leetmaa, chief scientist at NCEP. "We currently use the data continuously for our operational ocean analyses and El Niño forecasts. The use of this data set enabled a clearer picture to be developed of the multi-year evolution of ocean conditions in the tropical Pacific that have resulted in the onset of the current warm episode. We have not yet had a chance to utilize the NSCAT data in the models but we anticipate that its use also will improve our forecast system."

"Since the beginning of the instrument's operation in September 1996, NSCAT has observed stronger than normal easterly winds in the central and western tropical Pacific, which might have piled up warm water in the west as indicated by the higher than normal sea level and sea surface temperature," said Dr. W. Timothy Liu, NSCAT project scientist at JPL. "This is usually a precursor of subsequent anomalous warming in the east. Kelvin waves moving across the Pacific do not necessarily mean El Niño, but we are studying how these seasonal phenomena like Kelvin waves are related to events like El Niño that occur over several years. TOPEX/POSEIDON and NSCAT will provide continuous, near real-time observations of the critical developments in the Pacific in the months to come."

The climatic event has been given the name El Niño, a Spanish term for a "boy child," because the warm current first appeared off the coast of South America around Christmas. Past El Niño events have caused unusually heavy rain and flooding in California, unseasonably mild winters in the Eastern United States and severe droughts in Australia, Africa and Indonesia. Better predictions of extreme climate episodes like floods and droughts could save the United States billions of dollars in damage costs. El Niño episodes usually occur approximately every two to seven years.

The TOPEX/POSEIDON satellite uses an altimeter to bounce radar signals off the ocean's surface to get precise measurements of the distance between the satellite and the sea surface. These data are combined with measurements from other instruments that pinpoint the satellite's exact location in space. Every ten days, scientists produce a complete map of global ocean topography, the barely perceptible hills and valleys found on the sea surface. With detailed knowledge of ocean topography, scientists can then calculate the speed and direction of worldwide ocean currents.

The NASA scatterometer uses an array of stick-like antennas that radiate radar pulses in the Ku-band across broad regions of the Earth's surface. The way the radar signal bounces off the ocean's surface allows scientists to calculate both wind speed and direction. At any given time, NSCAT's antennas scan two swaths of ocean -- one on either side of the satellite's near-polar, sun-synchronous 500-mile (800-kilometer) orbit. The scatterometer takes 190,000 wind measurements per day, mapping more than 90 percent of the world's ice-free oceans every two days.

Both the TOPEX/POSEIDON altimeter and the NASA scatterometer are radar instruments, which allows them to operate 24 hours a day, collecting data day or night, regardless of sunlight or weather conditions.

The following Internet sites can be accessed for more information:

TOPEX/POSEIDON: **http://podaac.jpl.nasa.gov/topex**

NSCAT: **http://winds.jpl.nasa.gov**

NCEP:

http://nic.fb4.noaa.gov:80/products/analysis_monitoring/enso_advisory/index.html

JPL manages the TOPEX/POSEIDON and NASA Scatterometer missions for NASA's Mission to Planet Earth enterprise, Washington, DC.

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EDITORS NOTE: An image to illustrate this story is available to news media by contacting the Headquarters Audio Imaging Branch at 202/358-1900. The image number is:

97-HC-359

News Release

National Aeronautics and
Space Administration

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(202) 358-1600

For Release

May 29, 1997

Mike Braukus
Headquarters, Washington, DC
(Phone: 202/358-1979)

Linda Matthews Copley
Johnson Space Center, Houston, TX
(Phone: 281/483-8609)

RELEASE: 97-116

NASA, BAYLOR COLLEGE OF MEDICINE, SIGN AGREEMENT TO ESTABLISH A NATIONAL SPACE BIOMEDICAL RESEARCH INSTITUTE

NASA today signed an agreement with Baylor College of Medicine, Houston, TX, to establish a National Space Biomedical Research Institute. Baylor will lead a consortium of premier academic and research facilities across the country to conduct the focused biomedical research necessary to support human health in the exploration and development of space.

The agreement is for five years with three five-year extensions. The total value of the 20-year agreement is approximately $145 million. The Johnson Space Center, Houston, TX, will sponsor the Institute.

NASA identified the concept of a science institute as a means of maintaining the scientific excellence of its applied biomedical research through a greater involvement of the scientific community in NASA's overall research program.

The members of the National Space Biomedical Research Institute consortium are: Baylor College of Medicine; Harvard Medical School, Cambridge, MA; Johns Hopkins University's School of Medicine and Applied Physics Laboratory, Baltimore and Laurel, MD; Massachusetts Institute of Technology, Cambridge, MA; Morehouse School of Medicine, Atlanta, GA; Rice University, Houston, TX; and Texas A & M University, College Station.

The specific objectives of the Institute include:

- Implement a research plan that will lead to the knowledge and technologies required for long-duration space flight, including specific countermeasures;
- Ensure the dissemination of knowledge to the scientific community;

-more-

- Facilitate science community access to NASA's space biomedical research expertise and facilities;

- Ensure that technology development and knowledge are transferred to the private sector.

"The Biomedical Research Institute will greatly enhance the quality of our Life Sciences research program as we take advantage of the capability and expertise of the Baylor College of Medicine and the consortium," said Johnson Director George W.S. Abbey. "The consortium also will benefit by its involvement with NASA as we make our facilities and assets available to it. And the public will benefit as space technology is made available to solve problems here on Earth."

Dr. Ralph D. Feigin, President of Baylor College of Medicine said, "This venture is an exciting opportunity for the worlds of space science and biomedical science to join forces. We are particularly pleased that Baylor's Dr. Bobby R. Alford will serve as chairman of the National Space Biomedical Research Institute."

"Baylor College of Medicine, the consortium institutions and the integrated research teams are more excited than ever about the extraordinary challenge and potential that this powerful partnership between NASA and academia, linked to industry, offers," said Bobby R. Alford, M.D., chairman of the National Space Biomedical Research Institute Board.

"We believe the opportunities are unlimited to foster and enhance the Space Life Sciences and insure the safe long term human presence, development and exploration of space; which in turn, because of biomedical discoveries and advances in knowledge and technology, will enhance life on Earth," Alford added.

The director of the National Space Biomedical Research Institute will be Dr. Laurence R. Young, Apollo Professor of Astronautics at MIT. Dr. Young termed the institute "a major step toward further human exploration of the solar system."

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Video Advisory

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release
May 30, 1997

Deanna Corridon
Headquarters, Washington, DC
(Phone: 202/358-1733)

VIDEO ADVISORY: V97-53

PREPARING FOR THE WORST: HURRICANE SEASON APPROACHES

On NASA TV Friday, hurricanes, hurricanes and more hurricanes! In preparation for Hurricane season beginning on June 1, NTV will take an in-depth look at hurricanes, including animation, B-roll and interviews.

Replaying on NASA Television will be: images of deadly Tornadic thunderstorms over central Texas; orbiting NASA instruments imply that El Nino might be developing again in the Pacific Ocean; a new ceramic material designed to prevent spacecraft from burning up during reentry has just completed its first flight test; a software program designed to reduce aerodynamic drag on aircraft wings may improve their efficiency, leading to lower fuel costs; and Shuttle technology is being used to resurface roads improving driving conditions.

ITEM #1: 3-D ANIMATION OF HURRICANE FRAN
Looking into the eye of Hurricane Fran.

ITEM #1a: AIR CURRENTS WITHIN A HURRICANE
Animation depicting air currents in a hurricane.

ITEM #1b: HURRICANE ANDREW
B-roll of Hurricane Andrew as it progresses and its aftermath.

ITEM #1c: HURRICANE CATEGORIES

ITEM #1d: HURRICANE SPAWNING
1995 water vapor data showing hurricanes developing over the west coast of Africa.

ITEM #1e: GOES WEATHER SATELLITE IMAGES
Images of previous hurricanes -- Fran, Marilyn, Felix & Luis.

ITEM #1f: DEVELOPING WEATHER TOOLS
B-roll of researchers at the Scientific Visualization Studio at NASA's Goddard Space Flight Center (GSFC), Greenbelt , MD, studying new ways to process data from satellites in order to help forecasters make better weather predictions. *For more information on hurricanes, contact Doug Isbell at (202) 358-1753 or Allen Kentizer at (301) 286-2806.*

ITEM #1g: INTERVIEW - DR. FRITZ HASLER, RESEARCH METEOROLOGIST, GSFC

ITEM #1h: INTERVIEW - STEVE MAHER, COMPUTER SCIENTIST, GSFC

ITEM #2: REPLAY - TEXAS TWISTER
For more information contact Allen Kentizer at (301) 286-2806.

ITEM #3-3d: REPLAY - EL NINO BREWING AGAIN
For more information contact Doug Isbell at (202) 358-1753 or Mary Hardin at (818) 354-5011.

ITEM #4-4a: REPLAY - A BURNING ENTRANCE
For more information contact Jim Cast at (202) 358-1779 or David Morse at (415) 604-9000.

ITEM #5-5a: REPLAY - LESS OF A DRAG
For more information contact Dwayne Brown at (202) 358-1726 or Fred Brown at (805) 258-2663.

ITEM #6-6c: REPLAY - HIT THE ROAD
For more information contact Dave Drachlus at (205) 544-0034.

Video news file air daily at noon, 3, 6, 9 p.m. and midnight EDT.

NTV is available on GE-2, transponder 9C at 85 degrees West longitude, vertical polarization, with a frequency of 3880 MHz, and audio of 6.8 MHz.

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News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

June 2, 1997

Douglas Isbell
Headquarters, Washington, DC
(Phone: 202/358-1753)

Mary Beth Murrill
Jet Propulsion Laboratory, Pasadena, CA
(Phone: 818/354-5011)

NOTE TO EDITORS : N97-37

IMAGES OF JUPITER'S DRY SPOTS AND GLOWING AURORAS TO BE UNVEILED AT JUNE 5 GALILEO BRIEFING

New images from NASA's Galileo mission revealing dry spots and auroral light patterns on Jupiter will be presented at a press briefing on Thursday, June 5, at 2 p.m. EDT. The briefing will originate from NASA's Jet Propulsion Laboratory, Pasadena, CA, and will be carried live on NASA Television.

The latest images and data reveal the existence of areas where winds converge and cause clouds and moisture to evaporate, but also indicate that the giant, gaseous planet is not as dry overall as scientists had believed. This may clear up the controversy that arose after Galileo's probe entered the Jovian atmosphere on Dec. 7, 1995, and found very little moisture.

Scientists also will discuss new images and data which show that Jupiter's glowing auroras stretch in a thin, patchy ribbon-like strand near the poles. Scientists believe that, despite some similarities, auroras on Jupiter and on Earth are driven by different forces.

NASA Television is available through GE-2, transponder 9C at 85 degrees West longitude, vertical polarization, with a frequency of 3880 Mhz, and audio at 6.8 Mhz.

The new images will be released on the Galileo Internet home page at the following URL:

http://www.jpl.nasa.gov/galileo/

-end-

News Release

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release

June 2, 1997

Don Nolan-Proxmire
Headquarters, Washington, DC
(Phone: 202/358-1983)

John Bluck
Ames Research Center, Mountain View, CA
(Phone: 415/604-5026)

NOTE TO EDITORS: N97-38

NASA ROBOT 'BRAIN SURGEON' TO VISIT NEW YORK CONVENTION

A revolutionary new NASA robotic device, developed at the Ames Research Center, Mountain View, CA, that could help surgeons avoid dangerous hemorrhaging during delicate brain operations, will be unveiled at the Medical Design and Manufacturing Show, Jacob K. Javits Convention Center, New York, NY, June 3-5. The device also could lead to "smart" surgical tools that will increase the safety, accuracy, and efficiency of neurosurgical, exploratory surgical and breast and prostate cancer surgical procedures. Many more NASA medical innovations also will be featured at booth 941.

"NASA invests more than $5 billion in technology development annually," said Michael Weingarten, NASA's manager for business development, NASA Headquarters, Washington, DC. "It makes sense to bring that cutting-edge technology back to U.S. taxpayers when such a huge investment is being made," he stated. "Companies can work with NASA or with licensed NASA technicians in efforts that will lead to new company products."

Additional information about the Ames robot brain surgeon and other NASA inventions can be obtained by calling 1-800-678-6882 or by accessing the NASA Commercial Technology Network web page at URL:

http://ntas.techtracs.org

-end-

NOTE TO EDITORS AND NEWS DIRECTORS: You are invited to see a NASA robot 'brain surgeon,' and other NASA medical innovations that will dramatically improve the care doctors can offer cancer, AIDS, and hepatitis patients. NASA will be on location at the Medical Design and Manufacturing Show, Jacob K. Javits Convention Center, New York, NY, June 3-5, from 10 a.m. to 4 p.m. EDT daily. NASA representative Michael Weingarten can be reached at the convention by pager at 301-615-7617 to set up interviews.

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Debra Rahn
Headquarters, Washington, DC
(Phone: 202/385-1639)

June 2, 1997

Eileen Hawley/James Hartsfield
Johnson Space Center, Houston, TX
(Phone: 281/483-5111)

RELEASE: 97-117

WAKATA NAMED TO STATION ASSEMBLY FLIGHT

Japanese Astronaut Koichi Wakata will fly on STS-92, the third Space Shuttle mission to assemble the International Space Station, set for a January 1999 launch on Atlantis.

Wakata's assignment to the mission was announced by NASA Administrator Daniel S. Goldin and Japanese Science and Technology Agency Minister Riichiro Chikaoka, in Tokyo, Japan, today.

"NASA is honored to have Mr. Wakata participate in such an early and significant space station assembly mission," Goldin said. "His participation on this flight is symbolic of the close bond that has developed between the American and Japanese space programs, and the extent to which we rely upon one another to meet our mutual objectives in space."

Wakata was selected as an astronaut in 1992 and has one previous space flight to his credit. He flew as a Mission Specialist on STS-72 in January 1996 aboard Endeavour. During that flight, the crew retrieved the orbiting Space Flyer Unit satellite which was launched from Japan 10 months earlier, and deployed and retrieved the OAST-Flyer satellite.

On STS-92, he will be the primary operator of the Shuttle's Remote Manipulator System robot arm supporting space station assembly tasks to be performed during four scheduled spacewalks. STS-92 will be the fifth assembly flight and will build on previous American and Russian flights beginning with the launch of the Functional Cargo Block

-more-

(FGB) in June 1998. Prior to the arrival of Atlantis and the STS-92 crew, space station elements already delivered to orbit will include the FGB; Node 1 and two Pressurized Mating Adapters; the Service Module; and various logistical cargos that will be carried aboard the second Shuttle assembly mission in December 1998.

The remaining crew members will be named at a later date. For complete biographical information on Wakata and other astronauts, see the NASA Internet astronaut biography home page at URL:

http://www.jsc.nasa.gov/Bios/.

For information on the International Space Station, visit the Space Station home page at URL:

http://station.nasa.gov

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News Release

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release

June 3, 1997

Dwayne Brown
Headquarters, Washington, DC
(Phone: 202/358-1726)

Michael Finneran
Langley Research Center, Hampton, VA
(Phone: 757/864-6124)

David Morse
Ames Research Center, Mountain View, CA
(Phone: 415/604-4724)

RELEASE: 97-118

NASA STUDIES HIGH ALTITUDE RADIATION WITH UPGRADED ER-2

Using an upgraded NASA ER-2 aircraft, researchers at NASA's Langley Research Center, Hampton, VA, have begun a month-long campaign to measure radiation at high altitudes.

This campaign, funded by NASA's High-Speed Research program, is the first of several that will measure naturally occurring radiation from cosmic and solar rays at altitudes between 52,000 and 70,000 feet.

The data will be used to characterize the radiation environment for the aircrew and frequent-flying public on a future High-Speed Civil Transport. The High-Speed Civil Transport, a conceptual supersonic airliner, would carry 300 passengers at 2.4 times the speed of sound, at altitudes of up to 68,000 feet.

"The broad aim of the Atmospheric Ionizing Radiation ER-2 flight-measurements campaign is to understand the composition, distribution and intensities of cosmic and solar radiation at commercial supersonic transport-cruise altitudes," said Allen Whitehead, the High-Speed Research environmental impact manager.

"Our primary concern is the level of uncertainties in the knowledge of the upper atmosphere's radiation environment and the human body's response to that type of environment," said Dr. John Wilson, the Atmospheric Ionizing Radiation chief scientist.

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"Radiation measurements will be obtained by an array of instruments from the United States, Canada, Germany, United Kingdom and Italy in a collaborative effort devised by Dr. Wilson," said Donald Maiden, the Atmospheric Ionizing Radiation project manager. "The instrument types which make up the array were recommended by the National Council on Radiation Protection in a study sponsored by the High-Speed research program."

"The primary thrust is to characterize the atmospheric radiation and to define dose levels at high altitude flight. A secondary thrust is to develop and validate dosimetric techniques and monitoring devices for protection of the aircrew who work many hours at cruise altitudes," Maiden added.

According to Maiden, "Even though the exposure levels are higher at the higher cruise altitude, the typical flying public will actually receive less radiation exposure than on today's subsonic transports because of the higher speed of the High-Speed Civil Transport. This is another advantage for speed."

The flight program is a collaborative effort with the Department of Energy's Environmental Measurements Laboratory; NASA's Johnson Space Center; the Canadian Defense Research Establishment and Royal Military College; the German Aerospace Research Establishment; the United Kingdom's National Radiation Protection Board; the Boeing Company; and several domestic and foreign university guest investigators.

Recent modifications to the NASA ER-2, sponsored by NASA's Mission to Planet Earth program, increased its altitude capabilities, allowing it to reach easily those altitudes where the High-Speed Civil Transport will fly. The NASA ER-2 is based at NASA's Ames Research Center, Mountain View, CA.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

Michael Braukus
Headquarters, Washington, DC
(Phone: 202/358-1979)

Kyle Herring
Johnson Space Center, Houston, TX
(Phone: 281/483-5111)

June Malone
Marshall Space Flight Center, Huntsville, AL
(Phone: 205/544-0034)

For Release

June 3, 1997

RELEASE: 97-120

STUDY CONTRACTS AWARDED FOR POSSIBLE FLY-BACK BOOSTER

NASA has awarded contracts for $1 million each to Lockheed Martin and the Boeing Company to study a possible, future upgrade to the Space Shuttle in which the rocket boosters that power the Shuttle would fly back to the launch site, rather than drop into the ocean for later recovery.

The study effort being led by NASA's Marshall Space Flight Center, Huntsville, AL, is part of a continuing program to upgrade the current Shuttle fleet -- providing additional safety, improved operability, enhanced performance and reduced costs.

To complement its in-house examination, Marshall is asking each of the contractors for an in-depth concept definition on the liquid fly-back booster.

Proposals from industry will provide data and configuration studies for both the booster and its engine, focusing on the liquid fly-back booster concept -- including analysis and evaluation, model fabrication and wind-tunnel testing.

If the concept is implemented, the unpiloted, liquid fly-back boosters would become the first-stage boosters of the Space Shuttle system.

Under the systems integration concept being studied, a Shuttle launch using the upgraded booster would appear similar to the current system to an observer on the ground.

-more-

After separation from the Shuttle, however, the two booster rockets would begin coasting for nine minutes, rather than parachuting into the ocean. Then jet engines would be started, and the unpiloted boosters would fly back and land at the Kennedy Space Center, FL.

Other principal elements of the present Space Shuttle system -- including the orbiter, Space Shuttle main engines and external tank -- would remain essentially unchanged if the new boosters are incorporated.

- end -

Video Advisory

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release
June 4, 1997

Deanna Corridon
Headquarters, Washington, DC
(Phone: 202/358-1733)

VIDEO ADVISORY: V97-54

HOME SWEET HOME: FOALE SPENDS HIS FIRST TWO WEEKS ON MIR

On NASA TV Wednesday...British-born astronaut Michael Foale. Foale has spent the first two weeks of his four-month-long mission on board the Russian space station Mir. NTV will televise a highlight package of his mission to Mir including: suit-up, launch, docking, and onboard Mir.

ITEM #1: MICHAEL FOALE HIGHLIGHTS

Highlights of Astronaut Michael Foale's mission to the Mir space station from STS-84. *For more information contact Ray Castillo at (202) 358-4333.*

ITEM #1a: BEETLE MANIA

B-roll of beetles that Foale will be using in an experiment to study sleep patterns.

Video news file airs daily at noon, 3, 6, 9 p.m. and midnight EDT.

NTV is available on GE-2, transponder 9C at 85 degrees West longitude, vertical polarization, with a frequency of 3880 MHz, and audio of 6.8 MHz.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

Debra Rahn
Headquarters, Washington, DC
(Phone: 202/358-1639)

Joel Wells/George Diller
Kennedy Space Center, FL
(Phone: 407/867-2468)

For Release

June 4, 1997

RELEASE: 97-122

COLUMBIA PASSES MILESTONE TOWARD QUICK REFLIGHT

NASA's Space Shuttle program passed a major milestone today on its way to reflying the orbiter Columbia and the first reflight of the same payload and crew in Space Shuttle history. Columbia, which saw an abbreviated mission in April due to indications of a faulty fuel cell, was transported from Florida's Kennedy Space Center (KSC) Orbiter Processing Facility (OPF) to the Vehicle Assembly Building today where it will be mated with an external tank and solid rocket boosters in preparation for roll-out to Launch Pad 39A next week.

With the Spacelab payload secure in the orbiter's cargo bay, NASA remains on track for a targeted July 1 launch date for reflight of the Microgravity Science Laboratory mission.

Suspicious readings from one of Columbia's fuel cells compelled NASA managers to cut the STS-83 mission short after only four days in space, marking only the third time in Shuttle history that a mission was curtailed for mechanical reasons. The original mission was expected to last 16 days.

Since the return of Columbia following the shortened STS-83 mission, the suspect fuel cell has undergone extensive anaylsis. The conclusion is that an undetermined and isolated incident caused a slight change in the voltage of about one-fourth of the 96 cells that make up each fuel cell.

To ensure the health of the fuel cells pre-launch, the power plants will be started earlier than usual to allow for additional monitoring before liftoff. Also, the program is reviewing the possibility of installing new fuel cell performance monitors that will indicate individual cell "health" rather than a single monitor for each of three 32-cell substacks.

-more-

This will provide additional insight into pinpointing large voltage shifts in a single cell, which could indicate a potential problem, or a small voltage shift in a number of cells, which is a benign situation. Presently, the performance monitor provides a gross indication of fuel cell health, which caused the team to assume the worst in the case of STS-83.

As with all hardware issues on the Shuttle, fuel cell anomalies are taken seriously and reviewed extensively prior to clearing future missions for launch. Additionally, the flight rules are being reviewed to ensure that proper insight is provided to flight controllers in making decisions on the health of the fuel cells.

Columbia launched on April 4 and landed in Florida on April 8 without completing the mission's science objectives. About two weeks later, Shuttle program managers decided to refly the Microgravity Science Laboratory mission on STS-94 as soon as possible within safety guidelines.

"This decision demonstrated the Shuttle program's confidence in the KSC processing team," said Bob Sieck, Director of Shuttle Processing. "Special credit goes to the workers in Orbiter Processing Facility Bay 1. They produced a quality product in record time."

When marching orders were given, NASA's Shuttle and payload communities teamed up to give Columbia and the Spacelab payload a speedy turnaround. Once in the OPF, replacement of the problem fuel cell was the first order of business and that was completed the week after landing. Managers then put into motion a strategy that minimized the amount of rework performed on the Shuttle and reduced the time required to service the payload.

The ambitious schedule required that all experiment reservicing be done while the Spacelab remained in the Shuttle's payload bay. Between flights, Spacelab is normally removed and then transported to KSC's Operations and Check-out Building for rework in a spacious environment. Payload technicians overcame the Shuttle's cramped conditions and successfully completed many critical tasks such as replenishing the flammable fluids of a combustion experiment.

"This is the first time that a payload has remained in an orbiter between flights," said KSC Payload Manager Scott Higginbotham. "We are excited about having accomplished something that has never been tried before."

Working side-by-side with the payload team, Shuttle technicians and managers faced some challenges of their own. Normally an orbiter visits the OPF for about 85 days in preparation for its next launch, but this reflight called for about 56 days in the facility. Managers saved some time by deferring certain routine structural inspections until Columbia's next mission, but other work could not wait and had to be accomplished before launch.

-more-

For example, the Shuttle's forward reaction control system, located in the nose of the vehicle, had to be removed with three out of sixteen steering thrusters requiring replacement. Also, two of the three 85-pound auxiliary power units that provide hydraulic power to Columbia's flight control systems were replaced having reached their run-time limit between overhauls.

An important part of this time-saving strategy was to minimize the burden on the Shuttle processing team. "Most of the time savings in the OPF was the result of a concerted planning effort between NASA and our contractor partners," said Grant Cates, NASA flow director for Columbia. "Once the plan was in place, the team approached this challenge in much the same way that they approach every flow."

To further speed up Columbia's processing for reflight, managers took one main engine scheduled to fly on Atlantis in September and two engines from Columbia's November flight. The external fuel tank and solid rocket boosters being used on STS-94 were originally slated for mission STS-85.

With the original STS-83 astronauts slated to fly again on STS-94, additional time savings were achieved by leaving the crew compartment set-up virtually unchanged. The crew equipment interface test and the terminal countdown demonstration test, both familiarization exercises previously completed by the crew, were deemed unnecessary for this reflight mission.

Columbia is scheduled to roll out of the Vehicle Assembly Building on June 11, bound for launch pad 39A. The STS-94 launch is currently targeted for July 1 at 2:37 p.m. EDT.

Regardless of the efforts necessary to perform a quick turn-around of Columbia and its microgravity science payload, NASA managers and engineers are confident that no safety margins were compromised.

-end-

News Release

National Aeronautics and
Space Administration

Office of Inspector General
Washington, DC 20546

For Release
June 5, 1997

Roberta L. Gross
Inspector General
(Phone: 202/358-1220

Richard D. Triplett
Assistant Inspector General for Investigations
(Phone: 202/358-1233)

RELEASE: 97-002

Former NASA Secretary is Sentenced to Jail

On June 5, 1997, Justina M. Pettit of Parksley, Virginia, was sentenced in U. S. District Court, Norfolk, Virginia, to four months in jail, four months home confinement and three years supervised release. Pettit, a former employee of NASA's Wallops Flight Facility, Wallops Island, Virginia, pled guilty on February 26, 1997, to two charges in a Criminal Information in connection with an embezzlement scheme at the facility.

She was charged with embezzling over $14,700 from the Wallops Flight Facility Morale Activities Club account at the NASA Federal Credit Union and an account of an employee bargaining unit. At the time of the embezzlement, Pettit was the treasurer of the Morale Activities Club and president of the employee's bargaining unit. She resigned from her position at the facility and made restitution to the Morale Activities Club account.

The investigation of this matter was conducted by special agents from the NASA Office of Inspector General and Federal Bureau of Investigation. The prosecution was handled by Assistant United States Attorney Robert Krask, Eastern District of Virginia.

-END-

Video Advisory

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release
June 6, 1997

Debbie Rivera
Headquarters, Washington, DC
(Phone: 202/358-1743)

VIDEO ADVISORY: V97-55

GLOWING AURORAS SEEN NEAR JUPITER'S POLES BY GALILEO

On NASA TV Friday will be a replay of the animation of the new images of Jupiter taken by NASA's Galileo spacecraft. Data from these images show that Jupiter has auroras similar to Earth's, yet scientists believe they are driven by different forces. In addition, Jupiter's atmosphere is not as dry as once believed; rather, the atmosphere has dry spots where moisture has evaporated. Also replaying on NTV is the X-38 Advanced Technology Demonstrator arrival at NASA's Dryden Flight Research Center.

ITEM #1: JUPITER'S HOT SPOT - ANIMATION
Animation shows a simulated flight over the five micron hot spot on Jupiter.
ITEM #1a: HOT SPOT BLINK MOVIE - ANIMATION
Animation focuses on the wind patterns of Jupiter's equatorial region.
ITEM #1b: THERMAL EMISSION AND WATER CONTENT
Hubble images are used to create color global view of Jupiter.
ITEM #1c: GALILEO ENTERS THE HOT SPOT - ANIMATION
Animation shows evolution of the hot spot.
ITEM #1d: IMAGING JUPITER'S ATMOSPHERE - ANIMATION
Here, one second of video displays one second of actual events of June 26, 1996.
For more information contact Doug Isbell at (202) 358-1753.
ITEM #2: X-38 ARRIVES AT DRYDEN
NASA's first X-38 Advanced Technology Demonstrator for the proposed Crew Return Vehicle arrives June 4, 1997 at NASA's Dryden Flight Research Facility.
ITEM #2a: SPACE LIFEBOAT - ANIMATION
The X-38 is shipped from NASA's Johnson Space Center; animation depicts mission.
ITEM #2b: X-38 ROLLOUT
ITEM #2c: INTERVIEW - JOHN MURATORE
For more information contact Mike Braukus at (202) 358-1979.

Video news file airs daily at noon, 3, 6, 9 p.m. and midnight EDT.

NTV is available on GE-2, transponder 9C at 85 degrees West longitude, vertical polarization, with a frequency of 3880 MHz, and audio of 6.8 MHz.

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Douglas Isbell
Headquarters, Washington, DC
(Phone: 202/358-1753)

June 5, 1997

Jane Platt
Jet Propulsion Laboratory, Pasadena, CA
(Phone: 818/354-5011)

RELEASE: 97-123

GALILEO FINDS WET SPOTS, DRY SPOTS AND NEW VIEW OF JUPITER'S LIGHT SHOW

Jupiter has both wet and dry regions, just as Earth has tropics and deserts, according to new images and data from the Galileo spacecraft released today. The data may explain why Galileo's atmospheric probe found much less water than scientists had anticipated when it dropped into the Jovian atmosphere in December 1995.

"We had suspected that the probe landed in the 'Sahara Desert of Jupiter,'" said Dr. Andrew Ingersoll, a professor at the California Institute of Technology, Pasadena, CA, and member of the Galileo science team. "But the new data show there is moisture in the surrounding areas. Jupiter is not as dry overall as we thought."

The area where the probe entered was a clearing in the clouds -- a dry spot through which deeper, warmer layers can be seen. By studying various areas, including those resembling the probe entry site, the Galileo orbiter has helped scientists understand the probe results. In fact, the air around a dry spot has 100 times more water than the dry spot itself, according to Dr. Robert Carlson of NASA's Jet Propulsion Laboratory (JPL), Pasadena, CA, principal investigator for the imaging spectrometer instrument onboard Galileo.

Such dry spots cover less than one percent of the Jovian atmosphere, and they appear to be regions where the winds converge and create a giant downdraft, according to Cal Tech graduate student Ashwin Vasavada. In fact, the water content of the giant, gaseous planet varies at least as much as the moisture varies from place to place on Earth.

-more-

"Winds rise from the deep atmosphere and lose water and ammonia," explained Dr. Glenn Orton, a Galileo interdisciplinary scientist at JPL and Photopolarimeter-Radiometer co-investigator. "At the top, when they converge and drop back down, nothing is left to condense back into clouds, and a dry clearing is created. These dry spots may grow and diminish, but they recur in the same places, possibly because of the circulation patterns on Jupiter."

Ingersoll said the dry spots are found in a northern hemisphere band at five to seven degrees latitude. When the Galileo probe was released near the tops of the clouds, it found dry air underneath. But at other locations, the weather might be rather Earth-like.

In the months since the probe's descent, Galileo mission scientists have debated whether the dry conditions it encountered were due to the downdraft concept, or whether Jupiter's water had somehow been concentrated deep in the gas planet's interior as it formed and evolved four billion years ago. "There was a cosmo-chemical explanation and a meteorological explanation, and our latest analysis clearly favors the idea that the dry spots are a consequence of weather-related activity," Ingersoll said.

"Fifty miles below the cloud tops, we could expect thunderstorms, lightning and rain," Ingersoll added. "But in contrast to Earth, individual Jovian storms and weather systems sometimes last for months, years or even centuries. The Great Red Spot, for example, has existed for at least the 300 years that we've been aware of it."

Despite the relatively warm temperatures and the presence of water on Jupiter, Ingersoll said it is "highly unlikely" that the planet could sustain life in its thick, gaseous environment without any solid surface. He expressed the opinion that any Jovian life forms would have to hover, and "while we might imagine an advanced life form that could adapt, pre-biotic compounds would not survive in that environment and, therefore, evolution could not take place there."

The latest data from Galileo also shed new light on the auroras which glow in a narrow ring around the poles of Jupiter. The auroras, essentially a light show stretching like a ribbon around the planet, are created when charged particles collide with atmospheric particles, causing them to light up. The new images show the nightside aurora for the first time.

Dr. Scott Bolton of JPL, co-investigator for the Galileo plasma and plasma wave instruments, said the latest findings show "Jupiter's auroras are a lot like the auroras we see on Earth as the northern lights. However, we now know that the auroral arc on Jupiter is thin and patchy, and we can also estimate its altitude is between 300 and 600 kilometers."

These auroras had previously been viewed in ultraviolet light by the Hubble Space Telescope, and in infrared light by Earth-based telescopes, but Galileo was able to capture images of the auroras in visible light and from a closer vantage point.

Galileo was launched in 1989 and entered orbit around Jupiter on Dec. 7, 1995. The Galileo mission is managed by JPL for NASA's Office of Space Science, Washington, DC.

Images and other data received from Galileo are posted on the Galileo home page on the World Wide Web at URL:

http://www.jpl.nasa.gov/galileo

-end-

News Release

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

Michael Braukus
Headquarters, Washington, DC
(Phone: 202/358-1979)

For Release

June 6, 1997

RELEASE: 97-124

NASA NAMES SCIENCE HEAD

Arnauld E. Nicogossian, M.D., has been named Associate Administrator for NASA's Office of Life and Microgravity Sciences and Applications by NASA Administrator Daniel S. Goldin. Dr. Nicogossian has been the acting associate administrator for the office since May 1996.

As Associate Administrator Dr. Nicogossian manages a national and international program in research and development. Focus areas include life sciences, life support technology, biotechnology, materials sciences, aerospace medicine, occupational health and commercial programs, as they pertain to conducting experiments on the ground and in space.

In addition to his work with NASA for more than 25 years, Dr. Nicogossian has held an academic position since 1977 as an assistant professor, Department of Preventive Medicine, Uniformed Services University of Health Sciences, Washington, DC. A diplomate of the American Board of Preventive Medicine, he also is a fellow of the American College of Preventive Medicine, American College of Physicians, Aerospace Medical Association and the American Astronautical Society.

Dr. Nicogossian has received numerous honors and awards including: NASA Distinguished Service Award; NASA Contribution and Invention Award; Presidential Letter of Commendation for Community Services; S.P. Korolev Medal from the Russian Federation of Cosmonautics; W. Randolph Lovelace II Award, American Astronautical Society; and International Academy of Astronautics Life Sciences Book Award.

An author of more than forty scientific articles and a contributor to more than ten books, he received his medical degree from Teheran University, did a residency in internal medicine at Mount Sinai Hospital Services, Elmhurst, NY, and received a Master of Science Degree from Ohio State University.

-end-

Contract Announcement

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

Dwayne Brown
Headquarters, Washington, DC
(Phone: 202/358-1726)

June Malone
Marshall Space Flight Center, Huntsville, AL
(Phone: 205/544-0034)

For Release
June 9, 1997

RELEASE: C97-e

NASA SELECTS FOUR COMPANIES TO DEMONSTRATE LOW COST LAUNCH SYSTEM TECHNOLOGIES

NASA took another step today toward making space launch more affordable in the future with the selection of four proposals for negotiation leading to contract awards for the initial design of a flight demonstrator of new low-cost launch system technologies.

NASA's Marshall Space Flight Center, Huntsville, AL, has selected Universal Space Lines, Inc. of Newport Beach, CA; Summa Technology, Inc. of Huntsville; Aerojet-General Corp., Sacramento, CA; and Pioneer Rocketplane, Bladewood, CO, for negotiation. Anticipated total funding for the awards in fiscal year 1997 is $8 million. The contracts are expected to be awarded later this month.

During the next six months the selected companies will analyze the small payload market and develop low-cost launch system concepts and business plans for commercial operation of the systems.

The new launch system will focus on small experimental payloads that typically are not funded due to the expense of launch. This system could increase greatly the amount of research performed in space. Small payloads such as communications satellites and other commercial ventures in space also will benefit from inexpensive access to space.

The Bantam project will adapt common manufacturing techniques and existing commercial, off-the-shelf hardware to aerospace applications to develop new technologies and a resulting test vehicle. The goal is to develop a launch vehicle capable of placing a payload weighing approximately 400 pounds in orbit for $1.5 million. Today, that same 400-pound payload costs about $8 million -- or nearly $20,000 per pound -- to launch with current vehicles.

-more-

"Low cost is a primary objective of the Bantam system," said Garry Lyles, manager of NASA's Advanced Space Transportation Program at Marshall. "This project is identifying and developing low-cost component technologies that can reduce costs and make space transportation affordable. Now we're looking for ideas for actual launch systems that would incorporate these technologies."

The Bantam System Technology Project is one element of the Advanced Space Transportation Program -- a NASA initiative to reduce the cost of space launch and develop technologies for space transportation needs for the next 25 years. Marshall serves as NASA's Lead Center for Space Transportation Systems Development.

- end -

Video Advisory

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release
June 9, 1997

Deanna Corridon
Headquarters, Washington, DC
(Phone: 202/358-1733)

VIDEO ADVISORY: V97-56

"BABY" STARS, GALACTIC COLLISIONS & BLACK HOLES ON NTV

On NASA TV Monday, new images taken by NASA's Hubble Space Telescope of stars being born, galactic collisions, and more observations on black holes.

ITEM #1: PARENT AND OFFSPRING STARS
Images taken by Hubble's Near Infrared Camera and Multi-Object Spectrometer (NICMOS) of a "mother" star in the Cone Nebula triggering the formation of six "baby" stars.

ITEM #1a: INTERVIEW - DR. RODGER THOMPSON, NICMOS PRINCIPAL INVESTIGATOR, UNIV. OF ARIZONA

ITEM #2: DISK IN THE HEART OF GALACTIC COLLISION
NICMOS image of a 300-light-year-diameter disk around the double nucleus of two bright compact star clusters.

ITEM #2a: GALAXIES COLLIDING
Animation depicting two galaxies colliding.

ITEM #2b: GALAXY ARP 220
B-roll of NICMOS team members getting their first glimpse of Galaxy ARP 220.

ITEM #2c: INTERVIEW - DR. RODGER THOMPSON, NICMOS PRINCIPAL INVESTIGATOR, UNIV. OF ARIZONA

ITEM #3: BEAM FROM A BLACK HOLE
The Space Telescope Imaging Spectrograph (STIS) on Hubble captures an image of Galaxy NGC 4151 measuring the velocities of gas blobs caught up in a two-cone beam of radiation from a supermassive black hole at the core.

ITEM 3a: GALAXY NGC 4151
A Wide Field Planetary Camera-2 image of an oxygen emission from the gas at the heart of the NGC 4151 galaxy.

ITEM 3b: STIS OPTICAL IMAGE
Spectral image of the oxygen gas.

ITEM 3c: FALSE COLOR STIS OPTICAL IMAGE
False color image of two emission lines of oxygen gas.

ITEM 3d: STIS ULTRAVIOLET
Spectral image showing the velocity distribution of hot gas in the core of NGC 4151.

ITEM 3e: GALAXY NGC 4151 ANIMATION
Animation showing the dynamics of the inner part of NGC 4151.

ITEM 3f: INTERVIEW - MARY BETH KAISER, STIS TEAM MEMBER, JOHNS HOPKINS UNIVERSITY

For more information on the images, contact Doug Isbell at (202) 358-1753.

Video news file airs daily at noon, 3, 6, 9 p.m. and midnight EDT.

NTV is available on GE-2, transponder 9C at 85 degrees West longitude, vertical polarization, with a frequency of 3880 MHz, and audio of 6.8 Mhz.

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News Release

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For Release

Michael Braukus
Headquarters, Washington, DC
(Phone: 202/358-1979)

June 9, 1997

Vanessa McGowan
Juvenile Diabetes Foundation, New York, NY
(Phone: 212/479-7530)

RELEASE: 97-125

NASA JOINS THE FIGHT AGAINST DIABETES

NASA's Office of Life and Microgravity Sciences and Applications and the Juvenile Diabetes Foundation are embarking on a cooperative partnership to conduct research that addresses the treatment and monitoring of diabetes and diabetes-related problems.

The two parties signed a Space Act Agreement June 8, 1997, enabling NASA and the Foundation to initiate joint research activities that will build on the strengths of the two organizations and support their respective goals. In addition, the agreement provides for a technology transfer mechanism to make techniques and technologies developed by NASA researchers available to the diabetes research community. There is no exchange of funds under this agreement.

While NASA does not have a diabetes research program, the Agency is conducting research that would have an impact on the fight against diabetes. NASA sponsors research in the areas of protein crystal growth, three-dimensional tissue culturing and noninvasive diagnostic technologies that can support the development of improved treatments.

NASA has grown human insulin crystals on two Space Shuttle missions to a quality that has not been achieved on Earth. Through the use of X-ray defraction crystallization, a more precise structural view of insulin molecules has provided a new understanding which could lead to new insulin therapies through improved control over the effective rate of release of insulin into the blood stream.

-more-

One example of NASA's new noninvasive diagnostic technology is a portable laser light-scattering instrument to detect cataracts and other eye abnormalities in humans. Developed by Rafat Ansari at NASA's Lewis Research Center, Cleveland, OH, this device sends light waves through the eye and maps how they bounce off the internal structure of the eye, including the retina and cornea. Retinopathy, or retina disease, can be caused by or accelerated by diabetes, making the disease the leading cause of adult blindness in North America. Ansari's device, used on a regular basis during eye examinations, can help with early detection of diabetes-related optical problems, which in turn could lead to better treatment at earlier stages of the disease.

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News Release

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Debra Rahn
Headquarters, Washington DC
(Phone: 202/358-1639)

Eileen Hawley/James Hartsfield
Johnson Space Center, Houston, TX
(Phone: 281/483-5111)

For Release

June 9, 1997

RELEASE: 97-126

SPACEWALKERS NAMED FOR SPACE STATION ASSEMBLY FLIGHTS

A cadre of 14 Space Shuttle astronauts has begun intensive training in preparation for the spacewalks required for on-orbit construction of the International Space Station.

"It is important for us to begin work now to train the crews who will support Space Station assembly flights," said David C. Leestma, director of Flight Crew Operations. "These crew members will be exceptionally busy preparing for some challenging and demanding tasks, from initial assembly through installation of the robotic arm and an airlock for station-based spacewalks. We expect that these assignments may be refined in the future, with additional tasks as mission requirements dictate."

The first astronauts assigned to train for space station assembly tasks were Jerry L. Ross (Col., USAF) and James H. Newman, Ph.D., who were named to the STS-88 crew in August 1996. Training will now expand to include Leroy Chiao, Ph.D.; Robert L. Curbeam, Jr., (Lt. Cmdr., USN); Michael L. Gernhardt, Ph.D.; Canadian Astronaut Chris A. Hadfield (Lt. Col., CAF); Thomas D. Jones, Ph.D; Mark C. Lee (Col., USAF); Michael Lopez-Alegria (Cmdr., USN); William S. "Bill" McArthur, Jr., (Col., USA); Carlos I. Noriega (Major, USMC); James F. Reilly, II, Ph.D.; Joseph R. Tanner; and Peter J.K. "Jeff" Wisoff, Ph.D.

The specific assignments for these U.S. assembly flights, through August 1999, are:

Flight/Crew Members	Date	Payload
STS-88/Jerry Ross and Jim Newman ISSA-2A	July 9, 1998	Node 1; Connect power cables
STS-92/Leroy Chiao; Jeff Wisoff ISSA-3A Michael Lopez-Alegria and Bill McArthur	January 1999	Integrated Truss Portable Mating Adapter

- more -

STS-97/Joe Tanner and Carlos Noriega ISSA-4A	March 1999	Photovoltaic module
STS-98/Mark Lee and Tom Jones ISSA-5A	May 1999	U.S. Lab Module
STS-99/Chris Hadfield and ISSA-6A Robert Curbeam	June 1999	Lab outfitting; Remote Manipulating System
STS-100/Mike Gernhardt and ISSA-7A James Reilly	August 1999	Joint Airlock, High Pressure Gas Assembly

"The assignment of these crew members is a critical element in our ability to bring together the elements of the space station on the ground and then successfully assemble them in orbit," said Randy Brinkley, Space Station program manager. "I am highly pleased with the level of expertise and dedication these crew members bring to the program."

Each of the astronauts named for these assembly flights has previous spaceflight experience, with the exception of Curbeam, who will make his first flight in July 1997, and Reilly, who will make his first flight in January 1998. Ross, Newman, Chiao, Wisoff, Tanner, Lee and Gernhardt all have performed spacewalks during their previous flights. The remaining astronauts, Lopez-Alegria, McArthur, Noriega, Jones, Curbeam, Reilly and Hadfield are training for their first spacewalks. When Hadfield conducts his scheduled spacewalk in June 1999, he will become the first Canadian to walk in space.

For complete biographical information on these crew members and other astronauts, see the NASA Internet astronaut biography home page at address:

http://www.jsc.nasa.gov/Bios/

For information on the International Space Station, visit the Space Station home page at address:

http://station.nasa.gov

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(202) 358-1600

For Release

Don Savage
Headquarters, Washington, DC
(Phone: 202/358-1547)

June 9, 1997

Tammy Jones
Goddard Space Flight Center, Greenbelt, MD
(Phone: 301/286-5566)

Ray Villard
Space Telescope Science Institute, Baltimore, MD
(Phone: 410/338-4514)

RELEASE: 97-127

STEADY STREAM OF DISCOVERIES COMING FROM NEW HUBBLE INSTRUMENTS

Seeing a group of baby Sun-like stars surrounding their "mother star"; detecting a titanic shock wave smashing into unseen gas around a supernova; finding a disk at the heart of a galactic collision: these are among what are now becoming routine discoveries for astronomers as they finish checking out the Hubble Space Telescope's new instruments.

Like someone trying out a new camera, Hubble instrument teams have looked at a variety of objects and made some unexpected new findings along the way.

These results are being presented at the 190th Meeting of the American Astronomical Society in Winston-Salem, NC, by the principal investigator for the Near Infrared Camera and Multi-Object Spectrometer, Dr. Rodger Thompson of the University of Arizona, and Dr. Bruce Woodgate, principal investigator for the Space Telescope Imaging Spectrograph at NASA's Goddard Space Flight Center, Greenbelt, MD.

"We were very pleased to see this new generation of ultraviolet light sensors come up to full operation so successfully. That's a major step forward for space astronomy. We still have a lot of work to do to get them fully commissioned, but these first ultraviolet science images taken with the spectrograph are very promising," said Dr. David Leckrone, Hubble Project Scientist at Goddard.

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NEW FINDINGS FROM THE NEW INSTRUMENTS

PARENT AND OFFSPRING STARS

Peering through the dust in a nearby star-forming region called NGC 2264 that contains the Cone Nebula, the infrared camera has provided direct confirmation of a type of starbirth called "triggered" star formation. Though such a starbirth scenario has been theorized for years, this is the first direct observation on such a small-distance scale. This form of starbirth happens when a gale of high speed particles from a young massive star (called NGC 2264 IRS or Allen's Source) compresses nearby dust and gas until it is dense enough to trigger the formation of six much smaller and fainter Sun-like stars only a fraction of a light-year away from the massive "parent."

BLAST WAVE FROM SUPERNOVA

The spectrograph has discovered the first direct evidence for material from Supernova 1987A colliding with an outer ring of gas which was ejected before the star exploded. The fastest debris, moving at 9,000 miles per second or 1/20th the speed of light, is slamming into the slower moving gas which was ejected when the doomed star was a red giant. Astronomers report this is a new component of material around the star which was predicted to exist, but was never directly seen before.

DUST DISK DEEP IN THE HEART OF GALACTIC COLLISION

Probing the nucleus of the peculiar galaxy called Arp 220, the infrared camera has discovered a 300-light-year diameter dust disk and other remarkably complex structures around the galaxy's unique "double nucleus" of two bright compact star clusters. The disk, which may fuel a supermassive black hole or rapid star-formation activity, appears silhouetted against one of the twin star clusters at the nucleus.

BEAM FROM A BLACK HOLE

The imaging spectrograph, which just last month demonstrated its efficiency as a black hole hunter, now shows the results when the power of a black hole is unleashed into its surrounding environment. In a single observation, the spectrograph measured the velocities of hundreds of gas blobs caught up in a twin-cone beam of radiation emanating from a supermassive black hole at the core of galaxy NGC 4151. Follow-up observations reveal hot gas emanating from deep within the throat of the beam, near the vicinity of the black hole. These observations also allow scientists to map the mass outflows near the black hole. The surprisingly complex motion may offer clues to the galaxy's stellar population, the orientation of the beam in the past, or evidence of some kind of backflow of gas into the central cone regions.

-end-

Image files in GIF and JPEG format and captions may be accessed on the Internet via anonymous ftp from ftp.stsci.edu in /pubinfo

		GIF	JPEG
PRC97-16	NGC 2264	gif/n2264nic.gif	jpeg/n2264nic.jpg
PRC97-17	Arp 220	gif/a220nic.gif	jpeg/a220nic.jpg
PRC97-18	NGC 4151	gif/4151stis.gif	jpeg/4151stis.jpg

Higher resolution digital versions (300 dpi JPEG) of the release photograph are available in /pubinfo/hrtemp: 97-16.jpg, 97-17.jpg and 97-18.jpg (color) and 97-16bw.jpg, 97-17bw.jpg and 97-18bw.jpg (black & white).

GIF and JPEG images, captions and press release text are available via World Wide Web at:

http://oposite.stsci.edu/pubinfo/PR/97/16.html
http://oposite.stsci.edu/pubinfo/PR/97/17.html
http://oposite.stsci.edu/pubinfo/PR/97/18.html and via links in:
http://oposite.stsci.edu/pubinfo/Latest.html or
http://oposite.stsci.edu/pubinfo/Pictures.html.

NOTE TO EDITORS: Reporters who are unable to attend the 12:45 P.M. EDT press conference may have access to the audio by calling one of the following phone numbers: 407/867-1220; 407/867-1240; or 407/867-1260. Those using these lines will not be able to ask questions.

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Space Administration

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(202) 358-1600

For Release

Debra Rahn
Headquarters, Washington, DC
(Phone: 202/358-1639)

June 9, 1997

Joel Wells
Kennedy Space Center, FL
(Phone: 407/867-2468)

RELEASE: 97-128

KENNEDY SPACE CENTER ANNOUNCES NEW APPOINTMENTS

Loren Shriver has been named Deputy Director of NASA's Kennedy Space Center for Launch and Payload Processing, effective Aug. 15, 1997, after the launch of STS-85. Shriver has been serving as Manager of Launch Integration for the Space Shuttle Program. In the interim period, he will begin assuming duties of his new position while assuring a smooth transition of his previous duties to his successor in the Space Shuttle Program.

At the same time, Kennedy Director Roy D. Bridges, Jr. also appointed James Jennings as Deputy Director for Business Operations, and JoAnn Morgan as Associate Director for Advanced Development and Shuttle Upgrades.

The appointment of Shriver completes Bridges' top management team. Together, they will assist the Director in strategic planning and work in partnership with directors of line organizations on customer requirements and mission execution.

"With the addition of Loren Shriver to our existing senior staff, I think we have assembled an outstanding management team," Bridges said. "Their challenge will be to meet the needs of the Agency during the coming years of processing and launching the International Space Station, while preparing the Center to help attain the next goals when humankind will learn to work and explore beyond low-Earth orbit."

-more-

Shriver will provide executive leadership, strategic planning and direction for Kennedy's Agency-assigned responsibilities as the Center of Excellence for Launch and Payload Processing Systems. This includes payload carriers, Space Shuttle processing and launch, and processing of payloads including International Space Station elements, and responsibilities assigned to the Center for expendable launch vehicles.

Shriver has served as Launch Integration Manager since May 1993, responsible for final Shuttle preparation, mission execution and return of the orbiter to Kennedy following landings at Edwards, CA. A graduate of the Air Force Academy, he participated in development test and evaluation of the F-15 fighter aircraft and the T-38 lead-in fighter. Selected by NASA as an astronaut-candidate in January 1978, Shriver has flown three Shuttle missions — as pilot of STS-51C and as commander of STS-31 and STS-46.

Jennings will be responsible for direction of Kennedy's institutional services and staff functions, including financial management, procurement, administration and human resources, legal services, information management and equal opportunity. He has served as Acting Deputy Center Director since Jan. 9, 1997, and as Director of the Administration Office since May 1993. In the latter position, he was responsible for industrial labor relations, strategic planning, civil service personnel management and workforce analysis, continual improvement, university liaison and information management. Previously, Jennings served as Deputy Comptroller responsible for the Center's budget process.

Morgan will provide leadership for the Center's Shuttle flight systems upgrades and for creating a customer-driven environment and new opportunities for the Kennedy team to participate in cutting-edge technology development and application. She has served as Associate Director of Safety and Shuttle Upgrades since Sept. 1, 1996, responsible for improvements to meet Shuttle flight safety and operational requirements into the 21st century. Previously, she was Director for Safety and Mission Assurance and had worked in the Kennedy Payload Operations Directorate managing payload projects and ground operations. Morgan was Kennedy's first female senior executive and the first selected to lead an operating division at Kennedy.

-end-

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(202) 358-1600

For Release

Debra Rahn
Headquarters, Washington, DC
(Phone: 202/358-1639)

Rob Navias
Johnson Space Center, Houston, TX
(Phone: 281/483-8651)

June 10, 1997

NOTE TO EDITORS: N97-39

LINENGER NEWS CONFERENCE SET

U.S. astronaut Jerry Linenger will meet with the news media to discuss his flight on the Russian space station Mir on Friday, June 13 at 9 a.m. EDT at the Johnson Space Center, Houston, TX. The news conference will be broadcast on NASA Television with two-way question and answer capability for reporters at participating NASA centers.

Linenger completed the second-longest single space flight in U.S. history when he landed aboard the Shuttle Atlantis on May 24 after spending 132 days in space as part of the STS-84 crew. Linenger became a Mir crew member in January following the docking of Atlantis to the Mir during the STS-81 mission. Linenger was replaced on the Mir by astronaut Mike Foale, who is in the fourth week of a four-month research mission.

NASA Television is carried on a new satellite, GE-2, Transponder 9C at 85 degrees West longitude, vertical polarization, frequency 3880 Mhz, audio 6.8 Mhz.

-end-

Video Advisory

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June 10, 1997

Deanna Corridon
Headquarters, Washington, DC
(Phone: 202/358-1733)

VIDEO ADVISORY: V97-57

ROCKY 7 WILL ROCK YOUR WORLD!

On NASA TV Tuesday, students in San Pedro, CA, get a chance to explore the planet Mars in a simulation by using a Mars prototype rover called Rocky 7 and manipulating it across the Mojave Desert. NASA Television will replay images taken by NASA's Hubble Space Telescope of stars being born, galactic collisions, and more observations on black holes.

ITEM #1: ROVING ROCKY 7

Footage of Rocky 7 in the Mojave Desert, CA.

ITEM #1a: MANIPULATING ROVER

Footage of students operating the Rocky 7 rover. *For more information contact Doug Isbell at (202) 358-1753.*

ITEM #1b: INTERVIEW - RAYMOND ARVIDSON

ITEM #1c: INTERVIEW - DR. SAMAD HAYATI

ITEM #1d: STUDENT/TEACHER INTERVIEWS

ITEM #2-2a: REPLAY - PARENT AND OFFSPRING STARS

ITEM #3-3c: REPLAY - DISK IN THE HEART OF GALACTIC COLLISION

ITEM #4-4f: REPLAY - BEAM FROM A BLACK HOLE

For more information on the images, contact Doug Isbell at (202) 358-1753.

Video news file airs daily at noon, 3, 6, 9 p.m. and midnight EDT.

NTV is available on GE-2, transponder 9C at 85 degrees West longitude, vertical polarization, with a frequency of 3880 MHz, and audio of 6.8 Mhz.

-end-

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National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

Donald Savage
Headquarters, Washington, DC
(Phone: 202/358-1547)

Emil Venere
The Johns Hopkins University, Baltimore, MD
(Phone: 410/516-7160)

For Release

June 10, 1997

RELEASE: 97-129

HUBBLE IS FIRST TO SPOT COLLIDING SUPERNOVAS

Astronomers using the Hubble Space Telescope have taken the first images clearly showing interactions between two or more exploding stars, called supernovas, which are producing a tremendous display in a galaxy 17 million light years from Earth.

Debris speeding out from the supernovas is slamming together in a cosmic collision, the likes of which have never before been seen. The images are especially startling because the collision is taking place over a time period of perhaps a few hundred years, a fleeting blink of an eye in the ancient cosmos, according to William P. Blair, a Johns Hopkins University astrophysicist who led a team of scientists making the discovery.

Blair worked with two other astrophysicists: Robert A. Fesen, from Dartmouth College, and Eric M. Schlegel, from the Harvard-Smithsonian Center for Astrophysics. Their findings were detailed in a poster paper presented today during a meeting of the American Astronomical Society. The paper is on display from 10 a.m. to 6:30 p.m. in the South Main Hall of the Benton Convention Center, Winston-Salem, NC.

The astronomers were puzzled when they first spotted the object with a telescope at the Kitt Peak National Observatory in Arizona and with the ROSAT X-ray satellite. It was extremely bright in optical and X-ray light -- just like a young supernova -- a star much more massive than the Sun destroying itself in a titanic explosion. But further analysis showed that it did not have the proper mixture of elements, and it was expanding too slowly to be a young supernova. Instead, it had all the characteristics of a much older remnant of a supernova, in which the expanding bubble of debris has spread far into space, diffusing into the interstellar gas.

How, then, could it be so bright?

They found the answer after using the Hubble Telescope's Wide Field and Planetary Camera 2. The space telescope's superior resolution -- its ability to distinguish separate objects that are close to each other -- brought the matter into clearer focus. Whereas the bright point of light had looked like a single supernova from the ground, the Hubble image clearly showed the remnants of two or more objects colliding.

-more-

When a massive star explodes, gas and debris are thrown in all directions at speeds of up to 22 million miles an hour (36 million kilometers per hour), producing a shock wave and compressing the gas into a dense "shell" of material.

The Hubble image captured the shells from one or more supernovas crashing into each other, like "a train wreck," and producing a tremendous light display for an object so far away, Blair said.

Astronomers had predicted the process, but because the phenomenon is so short-lived, it had never been seen directly.

"It's the first time that we've identified one of these interactions right when the shells are in the process of slamming into each other," Blair said. "The reason this object is so bright is that we caught it at a very specific time in its evolution. And Hubble's resolution is what allowed us to see it."

The supernova interaction is taking place in a galaxy known as NGC 6946, located 17 million light years away in the northern constellation Cepheus. Like the Milky Way, it is a spiral galaxy, but it's about half the Milky Way's mass and size. The exploding stars probably were about 40 light years apart.

Supernova explosions have been seen in NGC 6946 at an extraordinary rate: Astronomers have observed six supernovas in that galaxy since 1917. Only one other galaxy has displayed so many supernovas.

"It indicates that not only is there a lot of star formation going on, but a lot of those stars are massive," Blair said. "They are evolving quickly, and they are exploding as supernovas."

- end -

NOTE TO EDITORS: Reporters may access an image of NGC 6946 and the supernova interaction on the Internet at the following URL:

http://www.jhu.edu/news_info/news/home97/jun97/ngc.html

Also, a hard copy of the image is available by contacting Emil Venere, in the Office of News and Information, Johns Hopkins University at 410/516-7160.

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(202) 358-1600

For Release

Douglas Isbell
Headquarters, Washington, DC
(Phone: 202/358-1753)

June 10, 1997

Diane Ainsworth
Jet Propulsion Laboratory, Pasadena, CA
(Phone: 818/354-5011)

RELEASE: 97-130

PROTOTYPE MARS ROVER COMPLETES SIMULATED MARS TREK

NASA's newest, six-wheeled prototype Martian rover – nicknamed Rocky 7 – has successfully passed its most rigorous field test yet, traveling six-tenths of a mile over rugged, Mars-like terrain, while conducting science experiments and snapping 580 photographs along the way.

The week-long series of field tests, carried out May 23-30 at Lavic Lake, an ancient lake bed about 175 miles east of Los Angeles, CA, was designed to simulate several weeks of a real Mars rover mission and to test the rover's ability to drive much greater distances than current rovers. In addition, Rocky 7 conducted five simulated science experiments in real-time and collected samples of soil and rocks that would be retrieved and returned to Earth by a later Mars mission.

"One of the chief objectives of these tests was to test Rocky 7's ability to traverse farther over a wide variety of terrain with more Mars-like characteristics than we did in the last set of tests in December 1996," said Dr. Samad Hayati, Rocky 7 task manager at NASA's Jet Propulsion Laboratory (JPL), Pasadena, CA. "The rover actually traveled about 80 percent farther than it traveled in the last set of tests, over three distinct terrains, using a minimum of instructions from us to guide its way."

The Rocky 7 rover represents the newest model of rovers that may be sent to Mars in the years 2001 and 2003. It looks, however, very similar to its predecessor, Sojourner, which will land on Mars on July 4. Rocky 7 weighs slightly more than Sojourner at 33 pounds and has about the same dimensions -- measuring 19 inches wide by 25 inches long by 12.5 inches tall. Rocky 7 also sports the same six-wheeled chassis and spring-less "rocker-bogie" mobility system, which allows the vehicle to conform to the contours of the surface and scale objects almost as tall as itself without tipping over.

-more-

Continued robotic exploration of Mars in the next century will focus on the search for water and evidence to confirm hints that life may have existed once in Mars' early history. Successive Mars missions will be designed not only to examine the planet's composition, atmosphere and weather, but also to identify natural resources that could be mined and used for eventual human expeditions to the red planet.

The southern side of Lavic Lake, located in the Twenty-Nine Palms Marine Corps Base near Palm Springs, CA, was chosen for the field tests because it is a playa, analogous to some regions of Mars, with areas of lava flow, cracked mud, terrain strewn with basalt rocks and an alluvial fan.

Rocky's travels began on a basalt flow covered with cobblestones resting in a layer of wind-blown silt, which offered a variety of obstacles for the robot to hurdle. Engineers tested some of the rover's new features, such as a 12.5-inch manipulator arm with four degrees of freedom. Mounted on the front of the vehicle, the arm carried a "point reflectance" spectrometer that could be extended four inches in any direction to study the color of various surfaces. In future rover missions on Mars, science instruments on the rover arm will help researchers determine the composition of surface soils and rocks.

Engineers also tested a 4.5-foot, antenna-like mast, which would be deployed once the future rover was out and about on Mars. The mast has three degrees of freedom and can be used in much the same way as an arm to deploy science instruments against rocks or align them in the nadir, or down-pointing, position. Two science instruments – a Moessbauer spectrometer and a nuclear magnetic resonance spectrometer – were mounted on the mast to study surface rocks with different types of coatings, such as red iron oxide and desert varnish, which might be found on Mars. To carry out the variety of science experiments performed during the week, Rocky 7 had to raise its mast 85 times.

Rocky 7 carried a pair of stereo imagers on the front and back of the vehicle, which acted as its "eyes." The rover was furnished with simulated descent imaging to recreate landing, then asked to deploy its mast and begin each traverse and sequence of imaging and science experiments.

"Images and science measurements were obtained in several regions of the basalt flow," said Dr. Richard Volpe, chief engineer on the rover development team at JPL. "This pavement of basalt boulders and outcrops offered many terrain obstacles for rover navigation and numerous targets for the rover to measure cobbles and the underlying dust."

In the second journey, the rover set out over the playa, strewn with craters and ejecta fields, and traveled into a crater. Using its mast and arm, the vehicle was able to measure properties of the mud-cracked floor. Rocky 7 also took images of its own tire tracks to help scientists update its location.

-more-

"The rover conducted several long traverses across the playa floor, taking images of the tracks left by its wheels so that we could trace its path," said Dr. Raymond Arvidson, science team lead and chairman of the Earth and Planetary Sciences Department at Washington University, St. Louis, MO. "The tracks are used to update positional information, after the observations are completed and help us map out the vehicle's next route."

The last excursion was the most challenging – an obstacle course taking the rover over an alluvial fan extending from the nearby mountains. There, Rocky 7 was asked to use its science instruments to look for evidence that water had been transported to the sediment and to explore the region for cobbles and boulders that had come from volcanic rocks, just as it will do on Mars some day.

"Imaging and spectroscopy data were acquired for the fan rocks and fine-grained sediment, and samples of the sediment were collected," Arvidson said. "The data are currently being analyzed and will be used to fine-tune rover designs and operations and to evaluate what can be learned about ancient lake environments and desert pavement formation."

By the end of the week, the rover had returned 580 images to remote operators in the field and those stationed at JPL. The field test simulated 32 days of a real Mars rover mission.

Classrooms across the country and as far away as Finland participated in a remote driving test on the last day of the field work. The demonstration was designed to determine how well the vehicle could be controlled remotely using a World Wide Web operator interface called the Web Interface for Telescience. Six schools in California, Oregon, Georgia, Idaho, Texas and Finland participated in the exercise to command the rover from their classrooms, as scientists will do one day from their home institutions.

Additional information about the field tests is available on the World Wide Web at:

http://wundow.wustl.edu/rocky7

More information about rover development for future Mars missions is also available at:

http://robotics.jpl.nasa.gov/tasks/scirover.

The Rocky 7 rover development and field testing was supported by JPL's Robotics and Mars Exploration Technology Program Office for NASA's Office of Space Science, Washington, DC.

-end-

News Release

National Aeronautics and
Space Administration
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(202) 358-1600

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June 11, 1997

Douglas Isbell
Headquarters, Washington, DC
(Phone: 202/358-1753)

Lanee Cobb
Stennis Space Center, Stennis, MS
(Phone: 601/688-3341)

RELEASE: 97-131

NASA SEEKS PROPOSALS FOR PURCHASE OF EARTH SCIENCE DATA AND PRODUCTS

NASA's Stennis Space Center, Stennis, MS, has issued a Request for Offers from private industry and other external organizations to provide unique Earth science data and related information products for purchase by the Agency.

This information will be used by science teams within NASA's Mission to Planet Earth enterprise, which manages NASA's portion of an internationally coordinated research effort to study the Earth as a global environmental system.

Consistent with U.S. national space policy, NASA is seeking new ways of doing business and more efficient methods of providing scientific information to researchers. The U.S. Congress provided $50 million in the fiscal year l997 NASA budget to initiate the purchase of Earth science data.

"We are seeking innovative proposals to supplement the traditional approach of government-owned and operated spacecraft providing the vast majority of data for remote-sensing research needs," said William Townsend, Acting Associate Administrator for Mission to Planet Earth. "We hope to determine whether industry is able to provide affordable measurements that meet our accuracy and coverage requirements, while at the same time meeting the needs of their commercial customers."

As NASA's lead center for commercial remote sensing, Stennis will manage the data acquisition by defining the procurement specifications, managing the evaluation process, and leading the business evaluation and risk assessment. The NASA Headquarters Office of Mission to Planet Earth will define the science requirements, provide overall scientific guidance, and make the final selection.

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Responses are due June 20, with Phase I selections to be announced by mid-August. The subsequent six months will be spent analyzing these sample data sets to evaluate their scientific utility.

Those selected to continue to Phase II will receive a letter describing the price, quantity of data and required data characteristics, based on terms and conditions commonly found in the commercial marketplace. This includes a "cash on delivery" approach to data acquisition by NASA, Townsend said. Proposals may include data collected from spaceborne instruments specifically orbited for this solicitation, or data produced by innovative processing of data from existing systems.

As part of its new ways of doing business, NASA plans to use approaches similar to this whenever it is within the ability of industry to respond to and accept the terms and conditions offered. Recognizing the groundbreaking nature of this approach, NASA will consider optional offers from this solicitation that exceed the existing $50 million budget if the offer provides the best value to NASA in executing the Mission to Planet Earth program.

The overall scientific goal of NASA's Mission to Planet Earth is to provide long-term understanding of the Earth's land, air, oceans and life as a total system. Its five science themes are land cover and land-use change; predicting seasonal climate change; natural hazards research and applications; long-term climate research; and ozone studies.

The text of the Request For Offers is available on the Internet at the following URL:

http://aim6msfc.msfc.nasa.gov/EPS/SSC/date.html

For further details, contact Rebecca Dubuisson of NASA Stennis at 601/688-1636.

-end-

Contract Announcement

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Dwayne Brown
Headquarters, Washington, DC
(Phone: 202/358-1726)

June 12, 1997

John Bluck
Ames Research Center, Mountain View, CA
(Phone: 415/604-5026)

RELEASE: C97-f

NASA AWARDS $148 MILLION CONTRACT TO HUGHES STX CORP.

NASA has selected Hughes STX Corp., Lanham, MD, for award of a $148.3 million contract to provide federal information processing services at NASA's Ames Research Center, Moffett Field, CA.

Included in the contract services are software development and maintenance, engineering operations and maintenance, network services, analysis, quality assurance and reviews. The contractor also will procure training, purchasing and subcontracting services, off-site facilities and travel.

The new, five-year award includes a one-year base period followed by four one-year options. Cost of the contract includes all options. The contract will be managed at Ames. The first year contract (base period) award is $32.7 million. The contract is a cost-plus-incentive-fee, task order, completion-type contract.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Jerry Berg
Marshall Space Flight Center, Huntsville, AL
(Phone: 205/544-0034)

June 12, 1997

INTERNET ADVISORY: I97-7

NASA SPACELINK UNVEILS A NEW LOOK

NASA Spacelink, an electronic resource specifically developed for use by the educational community, has been redesigned to make it more effective for teachers and students. Spacelink now features text and graphical interfaces, a powerful new search engine, improved navigation capabilities, and other enhancements that deliver information more efficiently. While Spacelink's primary purpose is to connect educators and students to NASA information, services, and materials, anyone with access to the World Wide Web is welcome to visit the site:

http://spacelink.nasa.gov

Educators can access materials chosen specifically for their educational value and relevance, including science, mathematics, engineering and technology education lesson plans; information on NASA educational programs and services; current status reports on Agency projects and events; and news releases and broadcast schedules for NASA Television. Spacelink also provides rapid and easy access to the information contained on virtually all public NASA Web sites.

NASA Spacelink began operating in 1988 and has grown to become one of the most comprehensive sources of NASA information, services, and materials. NASA Spacelink is an educational service offered by the Education Division at NASA Headquarters. Spacelink is maintained by the Education Programs Office at the NASA Marshall Space Flight Center in Huntsville, AL, and operational support is provided by the Information Systems Services Office at the Marshall Center.

NOTE: Due to directory changes, frequent Spacelink users may find that old bookmarks or links from other web sites no longer function. Visitors are urged to go directly to the NASA Spacelink Web page to update their bookmarks and cached links, or use Spacelink's new navigation capabilities to directly access areas of interest.

- end -

Video Advisory

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

Debbie Rivera
Headquarters, Washington, DC
(Phone: 202/358-1743)

For Release
June 12, 1997

VIDEO ADVISORY: V97-58

IT'S AN ANTI-ICING FLUID AND A DESSERT TOPPING

On Thursday, NASA TV will show how a NASA "food grade" de-icing fluid for aircraft can also be used on cars, roads, bridges, runways and ships. This patented fluid, which is non-toxic and environmentally friendly, was developed at NASA's Ames Research Center. In addition, NASA TV will have footage of the high-flying, record breaking Pathfinder aircraft, and highlights of Jerry Linenger's recent mission aboard Mir.

ITEM #1: FRIENDLY FLUID
Footage of NASA's de-icing fluid and its uses.

ITEM #1a: INTERVIEW - ROBERT LOCKYER, AMES RESEARCHER

ITEM #1b: INTERVIEW - LEONARD HASLIM, AMES ENGINEER

ITEM #1c: INTERVIEW - JOHN ZUK, AMES ENGINEER
For more information contact Don Nolan-Proxmire at (202) 358-1983.

ITEM #2: HIGH-FLYING ADORED
NASA's Pathfinder tops altitude record of all aircraft.
For more information contact Dwayne Brown at (202) 358-1726.

ITEM #3: LINENGER HIGHLIGHTS FROM MIR
For more information on the images, contact Debbie Rahn at (202) 358-1639.

Video news file airs daily at noon, 3, 6, 9 p.m. and midnight EDT.

NTV is available on GE-2, transponder 9C at 85 degrees West longitude, vertical polarization, with a frequency of 3880 MHz, and audio of 6.8 Mhz.

-end-

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National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release

June 12, 1997

Dwayne Brown
Headquarters, Washington, DC
(Phone: 202/358-1726)

Fred Brown
Dryden Flight Research Center, Edwards, CA
(Phone: 805/258-3449)

Eric Dunn
Pacific Missile Range Facility
Kekeha, Kauai, Hawaii
(Phone: 808/335-4560)

RELEASE: 97-132

PATHFINDER SETS NEW WORLD RECORD

The Pathfinder, a remotely piloted aircraft, set a new world record this week for high-altitude flight for solar-powered aircraft at the Pacific Missile Range Facility, Kauai, Hawaii.

The study of solar-powered, remotely piloted aircraft could lead to revolutionary technologies to conduct low-cost, high-altitude atmospheric and remote sensing studies.

During its flight on Monday, June 9, the aircraft reached an altitude of 67,350 feet, breaking the previous record of 50,500 feet it set on Sept. 11, 1995, at NASA's Dryden Flight Research Center, Edwards, CA.

Pathfinder is part of NASA's Environmental Research Aircraft and Sensor Technology (ERAST) Program, and was designed, manufactured, and operated by Aerovironment Inc., Simi Valley, CA. Pathfinder is a lightweight flying wing whose six electric motors each drive a propeller. Solar cells covering the 98-foot-wing span wing provide power to the motors and other systems.

Pathfinder's record-breaking flight began with a takeoff into light ocean breezes. After completion of low-level system checks, Pathfinder began climbing, and six hours into its flight, passed its previously set record of 50,500 feet. After the aircraft climbed to 67,350 feet, the decision was made to land. Pathfinder spent over 90 minutes flying above 60,000 feet. The solar-powered vehicle completed its mission with a perfect landing.

-more-

"This achievement is a direct result of the teamwork of NASA, the Pacific Missile Range Facility, Aerovironment, and the Kauai Community College," said Jennifer Baer-Riedhart, the Pathfinder Program Manager at Dryden.

A unique aspect of the Pathfinder flight test was the extensive use of special-purpose computational techniques developed by NASA's Ames Research Center, Mountain View, CA. These techniques were used to validate the aircraft's stability characteristics and to adjust the on-board control system characteristics "on the fly" at regular altitude intervals.

The Environmental Research Aircraft and Sensor Technology Alliance is made up of NASA, industry, and the environmental science community. Participants have access to NASA technology and expertise in return for giving assistance in NASA projects. Kauai Community College has personnel and equipment that assist in the maintenance, repair, and operation of the program's aircraft for which NASA provides technical work experience and additional equipment, including spare solar panels.

The Environmental Research Aircraft and Sensor Technology Program is NASA's response to growing scientific requirements for measurements at higher altitudes and longer durations than the current fleet of scientific platforms permits. The predominant focus of the program consists of advancing the technology of remotely piloted aircraft. Concurrent efforts in development, miniaturization, and integration of science sensors can be later applied to important science missions. Pathfinder is one of many projects and aircraft in the program.

Pathfinder's entire mission was monitored, and the world record will be certified, by the National Aeronautic Association's Capt. E.E. "Buck" Hilbert, Chairman of the Contest and Records Board.

Additional missions for Pathfinder this year include other high-altitude flights and several science missions with payloads supplied by Ames for monitoring coral reef degradation and deforestation around the island of Kauai.

-end-

NOTE TO EDITORS: Pathfinder photos are available on the Internet under NASA Dryden Research Aircraft Photo Archive, Dryden News and Feature Photos at URL:

http://www.dfrc.nasa.gov/PhotoServer

News Release

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

Don Nolan-Proxmire
Headquarters, Washington, DC
(Phone: 202/358-1983)

For Release
June 12, 1997

John Bluck
Ames Research Center, Mountain View, CA
(Phone: 415/604-5026)

RELEASE: 97-133

NASA AMES 'FOOD GRADE' ANTI-ICING FLUID ALSO REDUCES AUTO RUST

Combining increased efficiency with environmental safety, a NASA-developed fluid promises to make flying safer without introducing dangerous chemicals into the environment and also may reduce rust and corrosion on cars.

A three-engineer team at NASA's Ames Research Center, Mountain View, CA, designed the non-toxic fluid to keep ice from building up on airplanes. It is so environmentally safe that it has been referred to as "food grade," because the ingredients used in its creation have been approved by the Food and Drug Administration for use in food. When used in bulk, the NASA de-icer poses significantly less of an environmental hazard than chemicals currently in use.

"The new fluid also can increase flight safety, in keeping with one of NASA's major goals," fluid co-inventor Leonard Haslim of Ames said. "The food grade anti-icing fluid not only works as well as, or better than available fluids, but it is the only one that is non-toxic and totally biodegradable."

The invention also may save money now being spent to meet the Clean Water Act, he added. "The fluid can be put on runways, bridges, ships and automobiles, as well."

"When you look at the high costs of rust and other salt damage to cars, bridges, roads and the environment, it's obvious that using this new anti-icing fluid can save a lot of money," Haslim said. "You can even spray the stuff on your windshield the night before you go to work, and the next morning, the wiper blades will easily push the ice completely off the glass," he added.

Anti-icing fluids used today can sicken or kill water life, animals and humans due to ingredients such as ethylene glycol and additives. The new fluid contains propylene glycol that may be food grade, according to co-inventor, John Zuk, also of Ames.

-more-

Worldwide, about a half a billion gallons of aircraft de-icing fluid are used annually. Much of it could be replaced by the new non-toxic fluid, according to Haslim.

The anti-icing fluid will "grab" onto an airplane's surface better than current fluids when a plane is at rest. "Our new fluid produces a long-lasting barrier to ice build-up. But when the plane takes off, the fluid suddenly gets thinner, and it blows away so the wings are clean and have plenty of 'lift' force as the plane rises," explained Robert Lockyer, the third co-inventor on the three-man Ames team.

"I compare the green-colored fluid to lime sherbet when it's on the wing and limeade when the plane is moving," said Haslim.

The new fluid is neutral, neither an acid nor a base, and is non-conductive. It appears to be harmless to aircraft, pavement, bridges and vehicles, according to Haslim. "It shouldn't hurt plants, either," he said.

Development and test work on the new fluid were sponsored by the U.S. Air Force's Wright Laboratory, Wright-Patterson Air Force Base, OH. The Army Corps of Engineers' Cold Regions Research and Engineering Laboratory, Hanover, NH, is testing the fluid for use on highways, bridges, railways, canals and transportation and communications structures.

The Ames fluid is now under test by government and industry for aircraft use. Comparison tests will be run against corrosive de-icing salts as well as other de-icing materials, such as calcium magnesium acetate. If the tests show the new fluid is about as good as salts for ice removal, the fluid will be tried on a highway test strip.

The currently mandated containment and collection of de-icing fluids at airports will continue with the Ames fluid, say the inventors, because of the enormous quantities (400 to 1,000 gallons per aircraft) used. In such huge volumes, even the new fluid could harm aquatic life near airports by depleting the water's oxygen content as it biodegrades.

The Ames three-engineer team is developing a simple, very inexpensive system to reduce the volume of the used fluid at airfields. The Ames fluid can also be 'teamed-up with' another Ames patented invention that pulses ice from aircraft wings and surfaces during flight. Government patents, such as the one pending for the NASA anti-icing fluid, are often licensed to industry for commercial development.

People can learn more about the Ames anti-icing fluid and other NASA inventions by calling 1-800-678-6882 or by accessing the NASA Commercial Technology Network web page at URL: http://nctn.hq.nasa.gov/nctn/

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NOTE TO EDITORS: Photographs are available from the Headquarters Audio Imaging branch to illustrate this story by calling 202/358-1900. Photo numbers are: 97-HC-416, 97-HC-417 and 97-HC-418

News Release

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

Debra Rahn
Headquarters, Washington, DC
(Phone: 202/358-1639)

Kyle Herring
Johnson Space Center, Houston, TX
(Phone: 281/483-5111)

For Release

June 13, 1997

RELEASE: 97-134

ASTRONAUTS MCMONAGLE, HARBAUGH TAKE ON NEW ASSIGNMENTS .

Astronaut Donald R. McMonagle has been named manager, Space Shuttle Launch Integration, at the Kennedy Space Center, FL, replacing Loren Shriver, effective Aug. 15, following the STS-85 mission.

The announcement by Shuttle Program Manager Tommy Holloway follows the appointment of Shriver earlier this week to the staff of Kennedy Director Roy D. Bridges, Jr., as deputy director, launch and payload processing.

McMonagle will begin the transition to his new position immediately. He will be responsible for final Shuttle preparation, mission execution and return of the Orbiter to Kennedy following landings at Edwards Air Force Base, CA.

As the first manager of the then-newly formed directorate-level position of manager, Extravehicular Activity Projects Office, McMonagle was responsible for overseeing the development of all spacewalk requirements, techniques and tasks for Shuttle-based missions as well as assembly and operation of the International Space Station.

Gregory J. Harbaugh has been named acting manager of the Extravehicular Activity Projects Office, replacing McMonagle. That appointment by Johnson Space Center Director George Abbey is effective immediately to allow a smooth transition between the two, prior to McMonagle's move to Kennedy.

Harbaugh has extensive background in spacewalking, having done so during two different Shuttle missions, STS-54 and STS-82. Prior to his most recent flight, Harbaugh trained as the backup spacewalk astronaut for the first servicing mission to the Hubble Space Telescope in 1993.

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McMonagle and Harbaugh flew together on Shuttle flights STS-39 and STS-54. McMonagle was commander of his third mission, STS-66. Harbaugh also flew on STS-71, the first mission to dock with Russia's space station Mir, and most recently on the second servicing mission to the Hubble Space Telescope (STS-82) in February.

For complete biographical information on McMonagle, Harbaugh and other astronauts, see the NASA Internet astronaut biography home page at:

http://www.jsc.nasa.gov/Bios/

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

Debra J. Rahn
Headquarters, Washington, DC
(Phone: 202/358-1639)

Ed Campion
Johnson Space Center, Houston, TX
(Phone: 281/483-5111)

For Release
June 16, 1997

NOTE TO EDITORS: N97-40

BRIEFINGS SET FOR REFLIGHT OF MICROGRAVITY SCIENCE MISSION

Briefings will be held on Friday, June 20, at the Marshall Space Flight Center, Huntsville, AL, and the Johnson Space Center, Houston, TX, to discuss elements of the upcoming flight of Space Shuttle Columbia on the STS-94 mission, the reflight of the Microgravity Science Laboratory-1 mission.

The mission, originally flown in April as STS-83, was curtailed after four days due to a suspect electricity-producing fuel cell aboard Columbia. NASA decided to refly the mission, which is tentatively scheduled for launch on July 1. A firm launch date will be set on June 19 by NASA managers following a Flight Readiness Review at the Kennedy Space Center, FL.

The abbreviated briefing schedule includes a Microgravity Science Laboratory-1 science overview from Marshall at 10:30 a.m. EDT and a Mission Overview/Crew News Conference from Johnson at 2 p.m. EDT. STS-94 Lead Flight Director Rob Kelso will be joined for that briefing by STS-94 Commander Jim Halsell and Payload Commander Janice Voss.

The briefings will be seen on NASA Television with question-and-answer capability for reporters at participating NASA centers. NASA TV can be seen on GE-2, Transponder 9C, at 85 degrees West longitude, frequency 3880.0 MHz, audio 6.8 MHz.

BRIEFING SCHEDULE (all times are EDT)

10:30 a.m.	Microgravity Science Laboratory-1 Science Overview (Marshall)
2 p.m.	Mission Overview/Crew News Conference (Johnson) Rob Kelso, STS-94 Lead Flight Director Jim Halsell, STS-94 Commander Janice Voss, STS-94 Payload Commander

-end-

News Release

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

Douglas Isbell
Headquarters, Washington, DC
(Phone: 202/358-1753)

Dave Drachlis
Marshall Space Flight Center, Huntsville, AL
(Phone: 205/544-0034)

Liz Latt
Vanderbilt University, Nashville, TN
(Phone: 615/322-2706)

For Release
June 16, 1997

RELEASE: 97-135

WORKSHOP TO DISCUSS SOUTHEASTERN CLIMATE CHANGE; RESULTS COULD SAVE LIVES, MONEY AND PROPERTY

Representatives from federal, state and local governments, universities and industry in the Southeast will meet in Nashville, TN, from June 25-27 to begin a dialogue on how improved understanding of regional weather and climate changes could save lives, money and property.

Attendees at the Workshop on Climate Variability and Water Resource Management in the Southeast, hosted by Vanderbilt University, will discuss ways to promote cooperation between these groups to help protect and improve the environment and public health; better manage urban development; and mitigate the impact of natural disasters.

"By bringing together climate researchers with those who are most affected by our changing climate, we hope to share our current knowledge and predictive capabilities and define additional areas of research that will allow us to better understand how the changing climate is impacting the Southeast," said Dr. Ron Greenwood, manager of the Global Hydrology and Climate Center at NASA' s Marshall Space Flight Center, Huntsville, AL.

"We hope to evaluate the impact that our varying climate has on the quality of drinking water, ground and surface water contamination, changes in crop patterns, waste management, transportation, land use, population, urban air quality and high-energy demands," Greenwood said.

"As we are now beginning to understand and predict how rainfall and temperature will vary from year to year, farmers, utility planners and other natural resource managers in the

-more-

Southeast could reap significant economic benefits depending on their ability to use these predictions effectively," said Dr. Ron Ritschard, a climate researcher at the Global Hydrology and Climate Center. "An improved understanding of our changing climate could also allow us to better prepare for hurricanes, floods and tornadoes -- saving lives and property."

The Southeastern region includes the states of Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina and Tennessee. The workshop is sponsored by NASA's Mission to Planet Earth enterprise, the U.S. Geological Survey and the National Oceanic and Atmospheric Administration. It is one of seven in a series of regional climate change workshops sponsored by the U.S. Global Change Research Program and the White House Office of Science and Technology Policy.

The regional workshops, scheduled to occur between June and September 1997, will provide a basis for the first National Climate Change Assessment Workshop, to be held in November 1997 at the National Academy of Sciences in Washington, DC.
More information about the Southeastern Climate Change Workshop, including the workshop agenda, and a white paper that defines the climate issues to be discussed and the status of related research, can be found on the World Wide Web at the following URL:

http://www.hq.nasa.gov/office/mtpe/southeast/

-end-

NOTE TO EDITORS: Researchers who will lead the upcoming Southeastern Climate Change Workshop will be available to discuss its goals with the news media during a teleconference scheduled for 2 p.m. EDT on Wednesday June 18. Scheduled to participate in the teleconference are:

• Dr. James O'Brien, workshop co-chair and director for the Center for Ocean-Atmospheric Prediction Studies at Florida State University, Tallahassee, FL, an expert on Southeast U.S. climate variability.
• Dr. Michael Helfert, director Southeast Regional Climate Center in Columbia, SC, an expert in regional perspectives on climate variability.
• Dr. Roger Pielke Jr., climate researcher at the National Center for Atmospheric Research, Boulder, CO, an expert on the social and economic impact of climate variability.
• Dr. Robert Quayle, climate researcher at the National Climate Data Center, National Oceanic and Atmospheric Administration, Asheville, NC, an expert in global climate change.
• Dr. Ron Ritschard, climate researcher and workshop co-chair at the Global Hydrology and Climate Center and the University of Alabama in Huntsville.

Media interested in participating in the teleconference or in attending the workshop should call Kelly McFalls of NASA's Marshall Space Flight Center Public Affairs Office at 205/544-3317, or Liz Latt of Vanderbilt University's Office of Public Affairs at 615/322-2706.

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

Douglas Isbell
Headquarters, Washington, DC
(Phone: 202/358-1753)

Michael Mewhinney
Ames Research Center, Moffett Field, CA
(Phone: 415/604-3937)

Anne Watzman
Carnegie Mellon University, Pittsburgh, PA
(Phone: 412/268-3830)

For Release

June 17, 1997

RELEASE: 97-136

NASA, CARNEGIE MELLON UNIVERSITY TO TEST ADAPTABLE MOBILE ROBOT IN SOUTH AMERICAN DESERT

From laboratories and a science center in North America, a group of NASA and Carnegie Mellon University scientists will control a robotic rover this summer as it explores a desert in South America to learn more about driving automated vehicles on Mars and the Moon.

During the 45-day field experiment from June 15 to July 31, scientists from NASA's Ames Research Center, Moffett Field, CA, and Carnegie Mellon's Robotics Institute, Pittsburgh, PA, will conduct an unprecedented 120-mile robotic trek in the Atacama Desert in northern Chile. The scientists will test the ability of the robot, nicknamed Nomad, to navigate, explore and perform science tasks remotely.

"The primary objective of the Atacama Desert trek is to develop, evaluate and demonstrate a robot capable of long distance and long duration planetary exploration," said David Wettergreen, NASA Ames project manager.

"During different phases of this test, we will configure the robot to simulate wide-area exploration of the Moon, the search for signs of past life on Mars and the gathering of meteorite samples in the Antarctic, which makes for a really unique and challenging experiment," said Dave Lavery, Telerobotics Program Manager at NASA Headquarters, Washington, DC.

-more-

Chile's Atacama Desert, a cold, arid region located above 7,000 feet, was chosen for the field experiment because its harsh terrain is analogous to that found on Mars and the Moon. The desert's barren landscape features craters, rocks and loose sand without any vegetation due to the lack of rain.

"This site is pretty much what we expect to find on Mars," said Nathalie Cabrol, the expedition's NASA science team leader. "Our goal is to simulate several NASA planetary exploration missions, and this will provide some good training for future missions," Cabrol added. The desert trek also will test and validate tools and techniques that NASA has been developing for future planetary missions.

Nomad was designed and built by researchers at Carnegie Mellon's Robotics Institute. About the size of a small car, the robot weighs 1,600 pounds and features four-wheel drive/four-wheel steering with a chassis that expands to improve stability and travel over various terrain conditions. Four aluminum wheels with cleats provide traction in soft sand. Power is supplied by a gasoline generator and enables the robot to travel at speeds up to 20 inches per second. Nomad also contains onboard navigation sensors and computers to enable it to avoid obstacles without relying on a human operator.

Nomad's unique onboard panospheric camera provides live 360-degree, video-based still images of the robot's surroundings. The images will be displayed on large screens at Ames and Carnegie Science Center in Pittsburgh, where the public will have an opportunity to control the rover every day throughout the trek. The rover carries additional color video cameras to provide stereo vision for detecting obstacles and high-resolution color video cameras for experiments in remote geology to be conducted by NASA.

The total cost of developing Nomad and conducting the desert trek is $1.6 million. The project is funded by NASA with in-kind support from corporate sponsors and educational foundations. Information about the desert trek and live images and data from Nomad will be available on the Internet at URL:

http://img.arc.nasa.gov/Nomad

Carnegie Mellon also will maintain a website at URL:

http://www.ri.cmu.edu/atacama-trek

A website in Spanish has been established at URL:

http://www.entelchile.net/Nomad

-end-

Contract Announcement

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release

Douglas Isbell
Headquarters, Washington, DC
(Phone: 202/358-1753)

June 18, 1997

Allen Kenitzer
Goddard Space Flight Center, Greenbelt, MD
(Phone: 301/286-2806)

Pat Viets
NOAA/National Environmental Satellite, Data, and Information Service, Suitland, MD
(Phone: 301/457-5005)

RELEASE: C97-g

LOCKHEED MARTIN SELECTED TO BUILD SOLAR X-RAY IMAGER

NASA's Goddard Space Flight Center, Greenbelt, MD, and the National Oceanic and Atmospheric Administration (NOAA) have awarded a $54 million contract to Lockheed Martin Missiles & Space, Palo Alto, CA, for the development and delivery of solar-imaging instruments for future U. S. weather satellites.

The Solar X-Ray Imager instruments would be carried aboard upcoming NOAA Geostationary Operational Environmental Satellites (GOES-N, O, P and Q.)

The Solar X-Ray Imager instrument will take full-disk images of the Sun every minute. The data will be used by NOAA and the U.S. Air Force for solar forecasting and monitoring of special events such as solar flares or geomagnetic storms. The ability to monitor and forecast such events is valuable to operators and users of military and civilian radio and satellite communications systems, navigation systems and power networks, as well as to astronauts, high-altitude aviators and scientists.

The total basic contract value of $54,229,000 provides funding for an engineering model instrument and two flight instruments. In addition, there are two priced options, each for one additional instrument. The contract is a hybrid Cost Plus Award Fee/Incentive Fee agreement.

-more-

The incentive fee portion is a "structured cost incentive," whereby the contractor would pay a portion of cost overruns. Also, the U.S. government would receive a payback of the earned award fee in the event of an on-orbit instrument failure.

The Solar X-Ray Imager acquisition is a partnership between NASA and NOAA. The NASA Goddard GOES Project Office is responsible for the acquisition of the instrument and oversight of the contract, and will support NOAA during the post-launch operations phase. NOAA is responsible for determining the technical requirements for the Solar X-Ray Imager, funding the contract, operating the instrument in orbit, and disseminating and using the instrument data.

Other companies submitting proposals were Ball Aerospace Systems Division, Boulder, CO; Hughes Aircraft Company, Santa Barbara Remote Sensing, Santa Barbara, CA; and Panametrics, Inc., Waltham, MA.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Michael Braukus
Headquarters, Washington, DC
(Phone: 202/358-1979)

June 18, 1997

James Hartsfield
Johnson Space Center, Houston, TX
(Phone: 281/483-5111)

NOTE TO EDITORS: N97-41

KSC PRESS CONFERENCE, VIEWING HIGHLIGHT MEDIA OPPORTUNITIES FOR FIRST INTERNATIONAL SPACE STATION HARDWARE SHIPMENT

News media will have opportunities to cover the shipment next week of the first U.S.-manufactured element of the International Space Station, a component called Node 1, from NASA's Marshall Space Flight Center, Huntsville, AL, to the launch site at NASA's Kennedy Space Center, FL. Node 1 will be launched on Space Shuttle mission STS-88 in July 1998. Opportunities for coverage will include:

- JUNE 22 – NODE 1 DEPARTS MARSHALL SPACE FLIGHT CENTER, Huntsville, AL: The shipping containers carrying Node 1 and its ground support equipment will depart the Redstone Arsenal Army Airfield in Huntsville via two Air Force C-5 Galaxy aircraft between 9:30 p.m. and 10:30 p.m. EDT. News media interested in covering the departure should contact Greg Shell, Marshall Media Services Office, at 205/544-0034 by 5:30 p.m. EDT Friday, June 20.

- JUNE 23 – NODE 1 UNLOADED FROM CARGO AIRCRAFT AT KENNEDY SPACE CENTER, FL: The shipping container carrying Node 1 will be unloaded from the C-5 Galaxy aircraft at KSC's Shuttle Landing Facility at 6 p.m. EDT June 23. Media interested in covering the unloading should contact the Kennedy News Center at 407/867-2468.

- JUNE 26 – PRESS CONFERENCE FOLLOWED BY MEDIA VIEWING OF NODE 1 IN KSC PROCESSING FACILITY: A press conference is planned and will be televised live on NASA-TV from the Kennedy news center at 11 a.m. EDT June 26 with International Space Station Program Manager Randy Brinkley, STS-88 Commander Bob Cabana, Assembly Flight 2A Launch Package Manager Bill Bastedo and STS-88 Payload Manager Glenn Snyder. Questions will be taken from media at participating NASA centers.

-more-

Immediately following the press conference, at approximately 12:30 p.m. EDT, media at Kennedy will be able to view Node 1 in the Space Station Processing Facility. This will be the first time the node will be fully visible since its shipment, removed from the shipping container and shroud. During the walk-through, media will be accompanied by International Space Station Program managers and the STS-88 crew.

In accordance with facility regulations, media planning to attend the processing facility walk-through should wear long pants and closed-toe shoes. Clean room attire will not be required for this event. No food, tobacco, lighters, matches or pocket knives are permitted inside the facility. Electronic flash photography is permitted. The lighting in the facility is mercury vapor.

Accreditation for these events can be obtained by contacting the Kennedy News Center at 407/867-2468.

NASA Television is available through GE-2, transponder 9C at 85 degrees West longitude, vertical polarization, with a frequency of 3880 Mhz, and audio at 6.8 Mhz

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Don Savage
Headquarters, Washington, DC
(Phone: 202/358-1547)

June 18, 1997

Helen Worth
The Johns Hopkins University Applied Physics Laboratory, Laurel, MD
(Phone: 301/953-5113)

NOTE TO EDITORS: N97-42

BRIEFING SET FOR NEAR SPACECRAFT FLYBY OF ASTEROID MATHILDE

The Near Earth Asteroid Rendezvous (NEAR) spacecraft's planned flyby of the asteroid 253 Mathilde on June 27 is the topic of a media briefing scheduled for Monday, June 23, at 1 p.m. EDT. The briefing will preview planned mission activities and science objectives for the first flyby of this type of dark and primitive main-belt asteroid.

The briefing will originate from NASA Headquarters Auditorium, 300 E St., S.W., Washington, DC, and will be carried live on NASA TV with two-way question-and-answer capability for reporters covering the event from participating NASA centers.

Panelists will be:

* Dr. Wesley T. Huntress, Jr, Associate Administrator, Office of Space Science, NASA Headquarters,Washington, DC
* Robert W. Farquhar, NEAR Mission Director, The Johns Hopkins University Applied Physics Laboratory (JHUAPL), Laurel, MD
* Dr. Donald K. Yeomans, NEAR Science Team, Jet Propulsion Laboratory, Pasadena, CA
* Dr. Peter C. Thomas, NEAR Imaging Team, Cornell University, Ithaca, NY
* Dr. Andrew F. Cheng, NEAR Project Scientist, JHUAPL

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz. Audio of the broadcast will be available on voice circuit via the Kennedy Space Center, FL, on 407/867-1220.

- end -

Video Advisory

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release
June 19, 1997

Deanna Corridon
Headquarters, Washington, DC
(Phone: 202/358-1733)

VIDEO ADVISORY: V97-60

CELEBRATE THE SUMMER SOLSTICE WITH A COOL GLASS OF ICED TEA AND SOME "HOT" IMAGES OF THE SUN

On Thursday, NASA celebrates the Summer Solstice by televising "hot" images of the Sun.

ITEM #1: EVICTED FROM THE SUN
Images taken on Dec. 25, 1996, by the SOHO spacecraft showing a coronal mass ejection and comet grazing the Sun.

ITEM #1a: TAKING IN THE BIG PICTURE
Wider field of view of the coronal mass ejection.

ITEM #1b: EIT/LASCO COMPOSITE IMAGES
EIT/LASCO composite showing the Sun's active region and magnetic structure at the surface and how it reaches out into space.

ITEM #1c: LASCO C2 CORONOGRAPH IMAGE
Image from April 7, 1997, showing the expanding cloud around the whole Sun indicating the ejection is heading toward the Earth.

ITEM #1d: SOLAR FLARE UP
Image from April 7, 1997, showing the difference between the solar flare and the resulting shockcase in the lower part of the Sun's corona.

ITEM #1e: SOLAR FLARE MOVIE
A movie of a solar flare and the resulting shockcase.

ITEM #1f: MASS EJECTION RESULTS
Animation depicting the effect on the Earth's magnetosphere resulting from the Jan. 10-11, 1997, coronal mass ejection.

ITEM #1g: 8000 DEGREES FAHRENHEIT
EIT movie of the lower corona in the 8000 degree range.

ITEM #1h: POLAR SEQUENCE
Polar data sequence showing the effects of the Jan. 7, 1997, coronal mass ejection on the Earth's magnetic field.

ITEM #1i: SOHO SPACECRAFT ANIMATION
Animation depicting the SOHO spacecraft.

ITEM #1j: POLAR SPACECRAFT ANIMATION
Animation depicting the Polar spacecraft.

ITEM #1k: WIND SPACECRAFT ANIMATION
Animation depicting the WIND spacecraft.

ITEM #1l: SOHO SPACECRAFT LAUNCH
The launch of SOHO spacecraft in December of 1995.

ITEM #1m: SOHO MISSION OPERATIONS
B-roll of the SOHO mission operations center.

ITEM #1n: INTERVIEW - DR. ART POLAND, SOHO PROJECT SCIENTIST
Discusses the ISTP objectives. *For more information on this material, contact Bill Steigerwald (301) 286-0039.*

Video news file airs daily at noon, 3, 6, 9 p.m. and midnight EDT.

NTV is available on GE-2, transponder 9C at 85 degrees West longitude, vertical polarization, with a frequency of 3880 MHz, and audio of 6.8 Mhz.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

Donald Savage/Doug Isbell
Headquarters, Washington, DC
(Phone: 202/358-1547)

For Release
June 19, 1997

RELEASE: 97-137

NASA MOURNS DR. JURGEN H. RAHE, SOLAR SYSTEM EXPLORATION SCIENCE PROGRAM DIRECTOR

Dr. Jurgen H. Rahe, 57, Science Program Director for Exploration of the Solar System at NASA Headquarters, Washington, DC, died tragically June 18 in the Washington, DC, area. Dr. Rahe was killed during a severe storm when a large tree fell on his car as he was driving near his home in Potomac, MD.

Dr. Rahe had a distinguished career in NASA and in the field of astronomy and space exploration. In his most recent position, he was responsible for overall general management, budget, and strategic planning for NASA's Solar System Exploration programs, including the Galileo mission to Jupiter and several upcoming missions to Mars, including the July 4, 1997, landing of Mars Pathfinder.

"I am shocked and deeply saddened by the loss of Jurgen Rahe. He was a good friend and an extremely dedicated scientist," said Dr. Wesley T. Huntress, Jr., Associate Administrator for NASA's Office of Space Science, Washington, DC. "Under his leadership NASA's planetary exploration program was experiencing an almost unparalleled period of major discoveries at the same time that a number of new missions were being started and launched. His legacy to the exploration of space is large, and I like to think that Jurgen's ideas, hopes, and dreams are aboard many of the spacecraft now headed to the frontiers of our Solar System."

As a member of the Office of Space Science Board of Directors, Rahe also was responsible for the upcoming Cassini/Huygens mission to Saturn, NASA's low-cost Discovery missions and several upcoming missions to Mars. Dr. Rahe also was the editor of one scientific journal ("Astrophysics and Space Science") and a member of the editorial board of two others ("Earth, Moon, and Planets" and "Il Nuovo Cimento").

Dr. Rahe previously served as a Discipline Scientist, Chief Scientist for Planetary Astronomy, and Director of the Solar System Exploration Division at NASA Headquarters. Before joining Headquarters full-time in 1989, Dr. Rahe was a Staff Member at the California Institute of Technology/Jet Propulsion Laboratory in Pasadena, CA. He has also served as the Co-Leader of the International Halley Watch; Co-Investigator on the European Space Agency's Giotto mission; Program Scientist for the Clementine, Rosetta, and NEAR (Near Earth Asteroid Rendezvous) missions; and as the Associate Program Scientist for the Hubble Space Telescope.

-more-

Previously, he was a Professor of Astronomy and Director at the Astronomical Institute of the University Erlangen-Nuremberg (Germany). During his tenured professorship, Dr. Rahe worked for extended periods as a Visiting Professor in several different countries. He has published many papers in scientific journals and books, edited more than a dozen books and conference proceedings, and served as President and/or member of three International Astronautical Union committees. He also served previously as the Director of the Remeis Observatory in Bamberg, Germany.

Rahe is survived by his wife and daughter, who live in Potomac, MD.

- end -

News Release

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release

Donald Savage
Headquarters, Washington, DC
(Phone: 202/358-1547)

Lynn Simarski
National Science Foundation, Arlington, VA
(Phone: 703/306-1070)

June 19, 1997

RELEASE: 97-138

NASA AND NSF ANNOUNCE GRANTS TO STUDY MARTIAN METEORITE

NASA today announced the selection of 16 proposals to study samples of martian meteorite ALH84001. The proposals were solicited as part of a coordinated program with the National Science Foundation (NSF) that grew from the announcement last August that a NASA-led research team had found evidence of ancient martian life in a sample of martian meteorite ALH84001.

NASA and NSF called for further research into the finding, proposing a coordinated research program to investigate this and related meteorites in greater depth. The request for proposals, announced last December, resulted in 40 proposals made to NASA and an additional 21 made to the NSF. Proposals submitted to either agency were reviewed by science panels at both agencies.

The NASA grants were awarded under the Ancient Martian Meteorite Research program. Altogether, the awards total about $1 million for the first year and about $500,000 the second year. The individual grants range from $40,000 to $185,000 for the two-year period.

Meteorite ALH84001 is one of about 8,000 meteorites collected in Antarctica by U.S. researchers. The National Science Foundation is the lead agency for managing the collection and distribution of Antarctic meteorites, done in collaboration with NASA and the Smithsonian Institution. Samples of the ALH84001 meteorite are being sent from the Antarctic Meteorite Laboratory at NASA's Johnson Space Center, Houston, to the researchers. The samples, typically only a few grams each, are handled in a similar manner as are Lunar samples returned during the Apollo program.

The NSF Mars Rock program is managed by the Office of Polar Programs and the Divisions of Chemistry and Earth Sciences. Proposals received by NSF are now being evaluated and decisions are expected this summer.

-more-

Besides repeating and expanding on the original findings, the selected proposals will investigate four major areas: carbonate genesis and mineralogy; microbiology studies; organic chemistry; and age dating.

A list of the Ancient Martian Meteorite program selections is available on the Internet at URL:

http://www.hq.nasa.gov/office/oss/announce.alh8001.htm

- end -

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

June 20, 1997

Michael Braukus/Debra Rahn
Headquarters, Washington, DC
(Phone: 202/358-1778)

Joel Wells/Lisa Malone
Kennedy Space Center, FL
(Phone: 407/867-2468)

Kyle Herring/Ed Campion
Johnson Space Center, Houston, TX
(Phone: 281/483-5111)

NOTE TO EDITORS: N97-43

JULY 1 SELECTED FOR MICROGRAVITY SCIENCES LABORATORY REFLIGHT

NASA managers today set July 1 as the official launch date for Space Shuttle Columbia and the reflight of the Microgravity Science Laboratory-1 payload following completion of the STS-94 Flight Readiness Review at the Kennedy Space Center, FL. The original MSL-1 mission during STS-83 in April was shortened due to the suspect performance of a fuel cell.

The STS-94 launch window opens at 2:37 p.m. EDT and extends for 2-1/2 hours. The MSL-1 mission has a planned duration of 16 days. An on-time launch on July 1 and nominal mission duration will result in Columbia landing at the Kennedy Space Center at approximately 7:13 a.m. EDT, on July 17.

"The NASA contractor workforce has put forth an outstanding effort in getting the MSL-1 mission ready to fly again," said Johnson Space Center Director George Abbey, who chaired the meeting. "The quick turnaround in Columbia's processing for launch will allow the crew and the international team of investigators the opportunity to finish the important work they began earlier this year. The experiments and activities associated with STS-94 are a preview for the work that will be performed on the International Space Station."

STS-94 will be the 23rd flight of Columbia and the 85th mission flown since the start of the Space Shuttle program in April 1981.

-end-

Video Advisory

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

Deanna Corridon
Headquarters, Washington, DC
(Phone: 202/358-1733)

For Release
June 20, 1997

VIDEO ADVISORY: V97-61

NEAR SPACECRAFT TO WALTZ AROUND ASTEROID MATHILDE

The Near Earth Asteroid Rendezvous (NEAR) spacecraft's planned flyby of the asteroid 253 Mathilde on June 27, is the topic of a media briefing scheduled for Monday, June 23, at 1 p.m. EDT. In preparation for the asteroid flyby, NASA Television will televise B-roll of the Near Earth Asteroid Rendezvous spacecraft assembly and processing, launch and two interviews. NTV also will replay "hot" images of the Sun.

During the 1:00 p.m. NASA Gallery, NTV will run International Space Station Node 1 resource B-roll.

ITEM #1a: NEAR SPACECRAFT ASSEMBLY AND FINAL PROCESSING

B-roll of the Near Earth Asteroid Rendezvous (NEAR) spacecraft assembly at The Johns Hopkins University Applied Physics Laboratory; final processing at NASA's Goddard Space Flight Center; and solar panel integration at Cape Canaveral.

ITEM #1b: NEAR LAUNCH

B-roll of the NEAR launch from NASA's Kennedy Space Center, FL, on Feb. 17, 1996.

ITEM #1c: INTERVIEW - ROBERT FARQUHAR, NEAR MISSION DIRECTOR, THE JOHNS HOPKINS UNIVERSITY APPLIED PHYSICS LABORATORY

Discusses the asteroid Mathilde flyby, primary mission of NEAR, and potential problems with the asteroid flyby.

ITEM #1d: INTERVIEW - SCOTT MURCHIE, NEAR SCIENCE TEAM MEMBER, THE JOHNS HOPKINS UNIVERSITY APPLIED PHYSICS LABORATORY

Discusses why asteroid Mathilde is a good subject to study, the expected science return, and the instrument being used to study the asteroid. *For more information on NEAR and the Mathilde flyby, contact Don Savage at (202) 358-1727 or Helen Worth at (301) 953-5113.*

ITEM #2-2n: REPLAY - SOLAR PACKAGE

For more information on this material, contact Bill Steigerwald (301) 286-0039.

Video news file airs daily at noon, 3, 6, 9 p.m. and midnight EDT.

NTV is available on GE-2, transponder 9C at 85 degrees West longitude, vertical polarization, with a frequency of 3880 MHz, and audio of 6.8 Mhz.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

Donald Savage
Headquarters, Washington, DC
(Phone: 202/358-1547)

Dave Drachlis
Marshal Space Flight Center, Huntsville, AL
(Phone: 205/544-0034)

For Release

June 20, 1997

RELEASE: 97-139

EINSTEIN WAS RIGHT -- BLACK HOLES DO SPIN; NASA RESEARCH PROVIDES NEW INSIGHTS ON THESE MYSTERIOUS OBJECTS

A NASA scientist has made the first-ever observation of spinning black holes -- confirming Einstein's theory that black holes spin. The new observations from several orbiting spacecraft adds to the growing body of knowledge on how these mysterious objects are formed and behave.

Black holes -- predicted by Einstein's General Theory of Relativity -- are believed to result from the collapse of a star or a group of stars. A black hole is an extremely compact and massive object with such a powerful gravitational field that nothing -- not even light -- can escape.

In a paper to be published today by The Astrophysical Journal, Letters, Dr. Shuang Nan Zhang of the Universities Space Research Association at NASA's Marshall Space Flight Center, Huntsville, AL, and his research associates report that two of the black holes they have studied are rapidly spinning -- rotating 100,000 times per second -- while others are spinning very slowly or not at all.

By comparison, before this discovery, the Crab Pulsar was considered to be among the most rapidly spinning objects in the universe -- rotating 33 times per second.

"Black holes have always been difficult objects to define. We can only characterize them with three properties -- mass, charge and spin," said Zhang.

"In the past, we've only been able to measure a black hole's mass. But now that we've learned how to measure a second property -- spin rate -- one might say that we are two-thirds of the way to understanding black holes. This is a major leap in unraveling the black hole mystery," said Zhang.

"Determining the spin of black holes is of enormous importance, not only that the spin gives us an idea of how much angular momentum the black hole has 'swallowed' during its lifetime, but also we can examine whether the spin is related to the formation of powerful jets," said Dr. Mario Livio, senior scientific staff member at the Space Telescope Science Institute.

-more-

"The two rapidly spinning black holes also occasionally eject streams of high-speed material called relativistic jets from the black hole region -- at roughly the same speed at which the hole is spinning," said Zhang.

Since a black hole emits no light, the best way to observe it and learn about its properties is to study its interaction with the environment around it.

"The Theory of Relativity explains that there should be a last stable orbit around the black hole," said Zhang. "Material inside this orbit cannot survive and is consumed by the black hole."

The researchers determined the spin rate by accurately measuring the closest stable orbit of material around the black hole.

"The size of this orbit is related to the spin of the black hole. By looking at the material occupying this orbit and measuring the orbit's size, we can learn how fast the black hole is spinning," said Zhang.

To measure the orbit, Zhang and his colleagues, Dr. Wei Cui of the Massachusetts Institute of Technology, Cambridge, MA, and Dr. Wan Chen associated with both the University of Maryland at College Park and NASA's Goddard Space Flight Center, Greenbelt, MD, used data from several satellites -- the Compton Gamma Ray Observatory, the Rossi X-Ray Timing Explorer, the Roentgen Satellite, and the Advanced Spacecraft for Cosmology Astrophysics -- which collect X-rays emitted from the material orbiting near the black hole.

Using this technique, Zhang and his colleagues have measured the spins of several stellar mass black holes -- small black holes with masses comparable to stars.

Those measured reside in binary systems, comprised of a black hole and an ordinary star. The black hole, with its massive gravitational force, consumes material from the atmosphere of the companion star.

- end -

NOTE TO EDITORS: Additional information on spinning black holes is available on the World Wide Web at URL:

http://www.ssl.msfc.nasa.gov/newhome/headlines/ast24mar97_1.htm

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Michael Braukus
Headquarters, Washington, DC
(Phone: 202/358-1979)

June 23, 1997

Steve Roy
Marshall Space Flight Center, Huntsville, AL
(Phone: 205/544-0034)

RELEASE: 97-140

SHUTTLE MISSION REFLIGHT IN QUEST OF SCIENTIFIC MYSTERIES

Searching to solve Earth-bound scientific mysteries in space, teams of researchers are taking NASA's Microgravity Science Laboratory back into orbit aboard the Space Shuttle Columbia, targeted for launch on July 1.

This Shuttle mission will be a reflight of NASA's Microgravity Science Laboratory-1, dedicated to 33 experiments concentrated in the areas of combustion science, protein crystals and study of the properties of metals and alloys important to many industrial processes.

In April, the previous flight of the Microgravity Science Laboratory was cut short after four days because of a faulty fuel cell. The astronaut team and investigators at Marshall Space Flight Center, Huntsville, AL, were only able to begin their schedule of experiments, which had been planned for 16 days.

"Those four days allowed our science team to barely open the door to tantalizing scientific research," said Joel Kearns, manager of NASA's Microgravity Research Program Office at Marshall. "We were able to verify that we are headed in the right direction. But we were not able to reach our destination because of the shortened mission."

Kearns, nevertheless, cited important accomplishments during the abbreviated April mission. He said researchers tested their experiment hardware under flight conditions and it performed "extraordinarily." NASA and commercial research teams also acquired their first glimpses of some "never-before-seen phenomena," said Kearns.

-more-

The first observations of free-floating flame balls during the April flight were described by Dr. Paul Ronney of the University of Southern California in Los Angeles as "successful beyond my wildest dreams." His experiment, called the Structure of Flame Balls at Low Lewis-number, is designed to increase understanding of the characteristics of fuels and fires.

Dr. Gerard Faeth of the University of Michigan at Ann Arbor said that during the four-day flight, scientists got their first glimpse of the concentration and structure of soot from a fire burning in near-weightless conditions. The initial findings were an important step forward in understanding combustion and soot formation, he said. Like the flame ball experiment, this investigation could lead to improvements in fuel efficiency for all types of burning processes -- from car and jet engines to heating and cooking appliances.

"The success we've glimpsed from the shortened Shuttle mission in April makes it clear that we're heading in the right direction," said Kearns. "All activated research apparatus functioned in an outstanding manner. This upcoming mission has the potential to add considerably to our basic scientific knowledge and our quality of life here on Earth," Kearns pointed out.

-end-

News Release

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release

June 24, 1997

Douglas Isbell
Headquarters, Washington, DC
(Phone: 202/358-1753)

Franklin O'Donnell
Jet Propulsion Laboratory, Pasadena, CA
(Phone: 818/354-5011)

Rob Navias
Johnson Space Center, Houston, TX
(Phone: 281/483-3671)

NOTE TO EDITORS: N97-44

ROBOTIC MARS LANDING AND SPACE SHUTTLE REFLIGHT HIGHLIGHT A BUSY AND CHALLENGING WEEK FOR U.S. SPACE PROGRAM

The week of June 30 promises to be a busy and memorable one in the history of space exploration, with the landing of NASA's Mars Pathfinder spacecraft on Independence Day, a Space Shuttle launch of the STS-94 microgravity science mission, and ongoing activities on Russia's Mir space station.

NASA will offer near-continuous access to these events for the media and the general public. In addition to standard Space Shuttle-related mission activities, NASA TV will provide coverage of daily status briefings on Mars Pathfinder and extensive live programming on July 4-6 from the Jet Propulsion Laboratory (JPL) in Pasadena, CA. Telephone audio links will be available during overlapping events and numerous Internet sites are accessible for status reports and imagery. JPL also will operate a full-service newsroom for the Pathfinder landing from June 30 to at least July 11.

The latest comprehensive schedule for NASA TV, and updates to it as events progress, is available from NASA Headquarters; JPL; Johnson Space Center, Houston, TX; and, Kennedy Space Center, FL. It also is available on-line at the following URL:

ftp://ftp.hq.nasa.gov/pub/pao/statrpt/jsc/tvsked/tvsked.txt

Mars Pathfinder Coverage Information

News media should contact JPL's Public Information Office at 818/354-5011 for information on credentials for its newsroom. Please also notify JPL if you have a need for a Mission Audio feed of the STS-94 mission distributed to your work location in the von Karman Auditorium.

-more-

Beginning on June 30, the Mars Pathfinder landing newsroom at JPL will be open at 818/354-8999, during at least the following hours (all times EDT):

June 30-July 2	11 a.m.-8 p.m.
July 3	11 a.m.-11 p.m.
July 4	9:30 a.m.-3 a.m. (July 5)
July 5-6	11 a.m.-3 a.m.
July 7-11	11 a.m.-8 p.m.

Status reports on mission activities for Mars Pathfinder will be issued by the JPL Public Information Office. Daily audio status reports will be available by calling 800/391-6654 or 818/354-4210.

A pre-landing briefing on Mars Pathfinder and its science objectives at Mars will be held at JPL on Tuesday, July 1, at 1 p.m. EDT. If the STS-94 launch remains scheduled for this date, this briefing will not be shown live on NASA TV. A taped rebroadcast of this briefing currently is planned for later that evening and the next morning. Media can access a live audio feed of this briefing by calling 818/354-6170. During the briefing, the STS-94 countdown can be heard on a Mission Audio feed to JPL.

Extensive information on Mars Pathfinder, including an electronic copy of the landing press kit, related press releases, fact sheets, status reports and images, is available from the JPL World Wide Web home page at URL:

http://www.jpl.nasa.gov/marsnews

The Mars Pathfinder project also maintains a home page at URL:

http://www.jpl.nasa.gov/mpfmir

These sites may receive heavy traffic on the days close to landing, but Internet users around the world can follow the mission by way of multiple local mirror sites that are now on-line, with links listed at the Web site above. The Internet sites feature updates on mission activities and will provide Pathfinder photographs of the Martian surface, once they become available. The sites also will feature a bird's eye view of the Mars Pathfinder mission operations area at JPL, via a live video camera feed that is updated every 15 minutes.

Images returned by the Mars Pathfinder lander and rover will be released to the news media in electronic format only during the mission via addresses furnished to media upon request. These sites will include files offering the highest spatial and color resolution of images returned by the Pathfinder lander and rover. Images also will be carried on NASA Television during daily Video File broadcasts.

STS-94 Coverage Information

As with all Space Shuttle missions, the Johnson Space Center newsroom will be staffed 24-hours a day throughout the 16-day STS-94 mission, Microgravity Science Laboratory-1, beginning at 9 a.m. EDT on July 1. Information regarding the mission can be obtained by calling the JSC Newsroom at 281/483-5111.

Information on STS-94 is available through several sources on the Internet. The primary source for mission information is the NASA Shuttle Web. This site contains information on the crew and their mission and will be regularly updated with status reports, photos and video clips throughout the flight. The NASA Shuttle Web's address is URL:

http://shuttle.nasa.gov

If that address is busy or unavailable, the STS-94 Countdown Page can be found at URL:

http://www.ksc.nasa.gov/shuttle/missions/sts-94/countdown.html

and the MSL-1 Home Page can be found at URL:

http://liftoff.msfc.nasa.gov

Television coverage of STS-94 on NASA TV during the heaviest period of Mars Pathfinder activities will include update reports, Flight Day Highlights, the "Mission Update" program and Mission Status Briefings, when warranted. Uninterrupted air-to-ground feeds of conversations between the astronauts in orbit and ground controllers along with mission commentary can continue to be heard on Mission Audio, which will be distributed to the NASA centers, as is usually the case during Shuttle flights.

During the time when Mars Pathfinder activity is seen on NASA TV, a clean TV feed of Shuttle coverage also will be available at JSC. Reporters covering Mars Pathfinder at either JPL or the Kennedy Space Center will not be able to obtain a clean TV feed of Shuttle coverage after launch, only the programmed feed of both Mars Pathfinder and Shuttle activities through NASA TV.

If the launch of STS-94 is delayed until July 4, NASA will issue an updated TV events programming schedule at the Web site listed at the beginning of this Note To Editors.

NASA Television is broadcast on the satellite GE-2, transponder 9C, C Band, 85 degrees West longitude, frequency 3880.0 MHz, vertical polarization, audio monaural at 6.8 MHz.

-end-

Video Advisory

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Brian Dunbar
Headquarters, Washington, DC
(Phone: 202/358-0873)

June 24, 1997

VIDEO ADVISORY: V97-62

HAVE YOU EVER SEEN THE RAIN?

The NTV Video File begins with the U.S.-Japanese Tropical Rainfall Measuring Mission (TRMM). Set for launch Oct. 31, TRMM will measure the amounts and distribution of tropical rainfall, which distributes heat around the world through circulation of the atmosphere, affecting global climate. Also, NASA TV will air material in advance of the July 1 launch of STS-94, a reflight of April's abbreviated STS-83 Microgravity Sciences Laboratory (MSL-1) mission. Finally, there will be an interview with Gretchen McClain, head of the NASA Headquarters Space Station Office.

During the 1 p.m. NASA Gallery, NTV will run International Space Station Node 1 resource B-roll and Mars Pathfinder resource B-roll.

ITEM #1: MEASURING TROPICAL RAINFALL
Animation of the TRMM spacecraft, scheduled for launch Oct. 31.

ITEM #1a: TRMM SPACECRAFT PROCESSING
B-roll of the TRMM spacecraft in the cleanroom at NASA's Goddard Space Flight Center.

ITEM #2: READY FOR REFLIGHT
Footage from STS-83 experiments.

ITEM #2a: INTERVIEW: JOEL KEARNS, MICROGRAVITY PROGRAM MANAGER
Kearns discusses the record turnaround time of the reflight of STS-83 as STS-94.

ITEM #2b: INTERVIEW: DR. MICHAEL ROBINSON, MISSION SCIENTIST
Dr. Robinson discusses the importance of reflying the MSL-1 mission.

ITEM #3: STS-83 TEMPUS B-ROLL
Footage of the TEMPUS experiment from STS-83.

ITEM #3a: INTERVIEW: DR. JAN ROGERS, MATERIALS SCIENTIST
Dr. Rogers explains the reflight opportunities for the TEMPUS experiment.

ITEM #4: STS-83 COMBUSTION EXPERIMENT
Footage of the combustion experiment from STS-83.

ITEM #5: STS-83 PROTEIN CRYSTAL GROWTH EXPERIMENT
Footage of the protein crystal growth experiment from STS-83.

ITEM #6: NODE-1 ARRIVAL AND UNLOADING AT KSC (REPLAY)
Footage of the arrival and unloading of the first element of the International Space Station at the Kennedy Space Center.

ITEM #6a: INTERVIEW: GRETCHEN MCCLAIN
Ms. McClain explains the importance of the International Space Station.

ITEM #7: REPLAY OF STS-83 MISSION B-ROLL AND INTERVIEWS
These video files are replays from the STS-83 mission, being reflown in July as STS-94.

Video news file airs daily at noon, 3, 6, 9 p.m. and midnight EDT.

NTV is available on GE-2, transponder 9C at 85 degrees West longitude, vertical polarization, with a frequency of 3880 MHz, and audio of 6.8 Mhz.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Sonja Alexander
Headquarters, Washington, DC
(Phone: 202/358-1761)

June 24, 1997

RELEASE 97-141

NASA ADMINISTRATOR'S FELLOWSHIP PROGRAM RECIPIENTS ANNOUNCED

NASA recently announced the recipients of the 1997-98 Administrator's Fellowship Program. The program is designed to enhance the professional development of mid-career science, mathematics and engineering faculty at Historically Black Colleges and Universities, Hispanic-Serving Institutions and Tribal Colleges.

The program also provides an opportunity for NASA employees to teach and conduct research at minority colleges and universities and to help the universities become better qualified to assist NASA in its research and development mission.

The recipients are:

- Mariea C. Dunn, Southern University, Baton Rouge, LA
- Teresa D. Edwards, Spelman College, Atlanta, GA
- James T. Brown, Kennedy Space Center, FL
- Marla E. Perez-Davis, Lewis Research Center, Cleveland, OH
- Jon C. Goldsby, Lewis Research Center, Cleveland, OH
- Yolanda R. Hicks, Lewis Research Center, Cleveland, OH
- Mark D. Kankam, Lewis Research Center, Cleveland, OH
- Michael K. Ponton, Langley Research Center, Hampton, VA
- Ramona E. Pelletier-Travis, Stennis Space Center, Stennis, MS

The Fellowship Program is a two-part competitive program with two fellowships being awarded this year to individuals from outside the Agency, and seven to NASA employees. Teresa Edwards, the recipient from Spelman College, is Associate Professor and Chairperson of the Mathematics Department, and Mariea Dunn is Assistant Professor of Mechanical Engineering at Southern University. They will conduct research at the Langley Research Center, Hampton, VA, and the Marshall Space Flight Center, Huntsville, AL, respectively.

-more-

The seven NASA employees who were awarded fellowships will have the opportunity to serve as exchange scientists, engineers or managers at Florida A & M University, Tallahassee, FL; the University of Puerto Rico at Mayaguez; Howard University, Washington, DC; Hampton University, Hampton, VA; and Xavier University, New Orleans, LA, for a period of six months to two academic years. They will share their knowledge of the Agency's scientific and technical programs and lend real world experiences to the teaching process.

Through the participation of the Fellowship awardees from both academia and NASA, the universities will have an opportunity to gain knowledge of the scientific and technical needs of NASA and be in a better position to participate in Agency-sponsored research and development programs.

The program, scheduled to begin in September 1997 and run through May 1999, will be administered by the National Research Council. Information on the upcoming 1998-2000 competition can be obtained by contacting Lois Hobson in the Fellowship Office of the National Research Council, 2101 Constitution Ave., N.W., Washington, DC; 20418; tel. (202) 334-2872. The National Research Council is the principal operating agency of the National Academy of Sciences and National Academy of Engineering. It is a private, non-profit institution that provides science and technology advice under a congressional charter.

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News Release

National Aeronautics and
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Washington, DC 20546
(202) 358-1600

For Release

Debra Rahn
Headquarters, Washington, DC
(Phone: 202/358-1639)

June 24, 1997

Eileen Hawley
Johnson Space Center, Houston, TX
(Phone: 281/483-5111)

RELEASE: 97-142

JETT ASSUMES NASA MANAGER POSITION IN RUSSIA

Astronaut Brent W. Jett, Jr. (Cmdr., USN) will replace Michael Lopez-Alegria (Cmdr., USN) as the NASA manager of operational activities at Star City, Russia, near Moscow.

The eighth astronaut to serve in this rotational position, Jett will continue to support the training and preparations of NASA astronauts at the Gagarin Cosmonaut Training Center, Star City. He will be the primary liaison between NASA and cosmonaut training center management, and will continue the operational and personal relationships with Star City management and the cosmonauts, as American astronauts live and work in Russia.

Jett, who departed for Russia on June 22, joins fellow astronauts Wendy Lawrence (Cmdr., USN), David Wolf, M.D., William S. Shepherd (Capt. USN), and Andrew S. W. Thomas (Ph.D.), currently training in Star City. Lopez-Alegria will return to the Johnson Space Center, Houston, TX, to begin training as an extravehicular activity crew member for STS-92, the second U.S. mission to assemble the International Space Station.

Jett, 38, is a two-time Shuttle veteran, having flown previously on Endeavour's STS-72 mission in January 1996, and most recently on the fifth Shuttle/Mir docking mission, STS-81 in January 1997.

For complete biographical information on Jett and other astronauts, see the NASA Internet astronaut biography home page at URL:

http://www.jsc.nasa.gov/Bios/.

-end-

Date: Wed, 25 Jun 1997 14:53:02 -0400 (EDT)
From: NASANews@hq.nasa.gov
Subject: NASA Launch Manifest is Released
Sender: owner-press-release@lists.hq.nasa.gov
To: undisclosed-recipients:;

Debra J. Rahn
Headquarters, Washington, DC
(Phone: 202/358-1639)

June 25, 1997

Kyle Herring
Johnson Space Center, Houston, TX
(Phone: 281/483-5111)

NOTE TO EDITORS: N97-45

NASA LAUNCH MANIFEST IS RELEASED

Copies of the NASA Mixed Fleet, Payload Flight Assignments, June 1997 edition, are available from the NASA news centers or on the Internet at URL:

http://www.osf.hq.nasa.gov/manifest/

This manifest summarizes the missions planned by NASA for the Space Shuttle and Expendable Launch Vehicles (ELVs) as of June 1997. Space Shuttle and ELV missions are shown through calendar year 2003. Space Shuttle missions for calendar years 2002-2003 are under review pending the resolution of details in the assembly sequence of the International Space Station.

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News Release

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release

Douglas Isbell
Headquarters, Washington, DC
(Phone: 202/358-1753)

Allen Kenitzer
Goddard Space Flight Center, Greenbelt, MD
(Phone: 301/286-2806)

Yasuyuki Fukumuro
National Space Development Agency of Japan, Tokyo
(Phone: 81-3-3438-6107)

June 25, 1997

RELEASE: 97-143

TROPICAL RAINFALL MEASURING MISSION SET FOR OCTOBER 31 LAUNCH

NASA and the National Space Development Agency of Japan (NASDA) have set October 31 at 3:40 p.m. EST (Nov. 1, 1997, 5:40 a.m., JST) as the official launch date for the Tropical Rainfall Measuring Mission.

The first Earth science satellite dedicated to studying the properties of tropical and subtropical rainfall, the Tropical Rainfall Measuring Mission (TRMM) carries microwave and visible/infrared sensors, and the first spaceborne rain radar. Tropical rainfall comprises more than two-thirds of global rainfall and is the primary distributor of heat through the circulation of the atmosphere. More precise information about this rainfall and its variability is crucial to understanding and predicting global climate change.

"We're very excited about this major opportunity for cooperation with Japan, which is NASA's largest international partner in Earth science," said William Townsend, Acting Associate Administrator for NASA's Mission to Planet Earth enterprise, Washington, DC. "The Tropical Rainfall Measuring Mission has great potential to improve scientific understanding of climate processes related to the heat released by tropical rainfall. In turn, this knowledge improves the global atmospheric circulation computer models that are used to make weather and climate forecasts."

NASDA will provide the Precipitation Radar for TRMM and an H-II rocket to launch the observatory on a three-year mission from the Tanegashima Space Center in Japan.

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"We are very happy to provide the Precipitation Radar for TRMM and launch this first space mission to measure a driving force of the global atmosphere, tropical rainfall. We hope this U.S.-Japan joint mission provides important data for predicting global climate change and weather anomalies," said Dr. Kazuyoshi Yoshimura, Executive Director of NASDA in Tokyo. "We will launch TRMM in November, and hereafter we can launch a rocket in each fall season. This is a good opportunity to expand the cooperation between the U.S. and Japan, and we expect a further cooperation in various fields, such as Earth observation satellites, Earth science, and global change research."

NASA's Goddard Space Flight Center in Greenbelt, MD, fabricated the observatory's structure and support systems, integrated and tested the spacecraft and is providing two science instruments. Two other instruments are being provided by NASA's Langley Research Center, Hampton, VA, and its Marshall Space Flight Center, Huntsville, AL.

Goddard also will operate TRMM via NASA's Tracking and Data Relay Satellite System. NASA and NASDA will share responsibility for science data processing and distribution to the global change research community.

Current knowledge of rainfall is limited, especially over the oceans. By flying in a low-altitude orbit of 217 miles (350 kilometers), TRMM's complement of state-of-the-art instruments will provide extremely accurate measurements of the distribution and variability of tropical rain and lightning, and the balance of solar radiation absorbed and reflected by Earth's atmosphere.

Extensive prelaunch testing of TRMM was completed recently and the observatory currently is undergoing final preparations for its shipment to the Japanese launch site in late August.

The TRMM launch window opens at 5:40 a.m. JST on Nov. 1, and with an approximate two-hour launch window daily for a 40-day period. TRMM's companion payload on the H-II rocket will be Engineering Test Satellite-7, a Japanese robotics experiment.

The TRMM project is part of NASA's Mission to Planet Earth enterprise, a long-term, coordinated research effort to study the total Earth system and the effects of natural and human-induced changes on the global environment. TRMM is managed by Goddard for NASA's Office of Mission to Planet Earth, Washington, DC.

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Video Advisory

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release
June 30, 1997

Brian Dunbar
Headquarters, Washington, DC
(Phone: 202/358-0873)

VIDEO ADVISORY: V97-65

MIR, SPACE SHUTTLE, MARS: A WEEK-LONG NTV SMORGASBORD

From the scheduled July 1 launch of STS-94 through the landing of Mars Pathfinder, set for July 4, NASA Television's broadcast schedule will be very volatile. NASA Television coverage of the STS-94 launch begins at 8 a.m. EDT on July 1. The NASA Headquarters Video File, scheduled for noon EDT July 2 and 3, will consist primarily of animation and interviews relating to Mars Pathfinder, along with updates on the status of Mir and U.S. astronaut Michael Foale. NASA Television coverage of the STS-94 launch begins at 8 a.m. EDT on July 1.

The most recent combined NTV schedule, including briefings and commentary for STS-94 and Mars Pathfinder, Video Files and Mir status reports, can be found on Internet at:

ftp://ftp.hq.nasa.gov/pub/pao/statrpt/jsc/tvsked/tvsked.txt

This schedule will be updated as events warrant. No further Video Advisories are planned for this week.

NASA Television is available on GE-2, transponder 9C at 85 degrees West longitude, with vertical polarization. Frequency is on 3880.0 megahertz, with audio on 6.8 megahertz.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

Don Nolan-Proxmire
Headquarters, Washington, DC
(Phone: 202/358-1983)

For Release

June 30, 1997

Keith Henry
Langley Research Center, Hampton, VA
(Phone: 757/864-6120)

RELEASE: 97-146

NASA LICENSES AIR QUALITY MONITORING TECHNOLOGY

A technology originally developed for monitoring atmospheric air quality now is being used to help U.S. industries reduce smokestack pollution.

A remote gas sensor with NASA technology could detect industrial pollution at or near the ground with a "fence" system that would allow the sensor to see around an area with the help of mirrors.

NASA is working with MERCO, Incorporated, Golden, CO, to jointly develop and commercialize the technology through a patent license agreement.

Under the agreement, NASA's Langley Research Center, Hampton, VA, will transfer its fast-response, nonmechanical, remote gas-sensing technology for monitoring gaseous pollutants emitted from petroleum refineries and chemical manufacturing facilities to MERCO.

Although originally developed to measure gases in the Earth's atmosphere from aircraft and satellite platforms, the technology's improved design makes it attractive for many Earth-based monitoring applications. The device possesses many distinct advantages over conventional gas sensors, such as the capability for remote sensing, area source monitoring, higher reliability, faster response and a more compact design.

The agreement was facilitated by the Mid-Continent Technology Transfer Center, College Station, TX. The Center worked closely with MERCO by preparing a brief marketing study and then, in conjunction with MERCO and the University of Colorado, developing a milestone plan for evolving the prototype into a commercial product.

The company anticipates rapid commercialization of the instrument for use by the private sector.

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News Release

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

Don Savage
Headquarters, Washington, DC
(Phone: 202/358-1547)

For Release
June 30, 1997

Helen Worth
The Johns Hopkins University Applied Physics Laboratory, Laurel, MD
(Phone: 301/953-5113)

RELEASE: 97-147

ASTEROID MATHILDE REVEALS HER DARK PAST

More than 100 years after her discovery, asteroid 253 Mathilde has been sharing her secrets with scientists in the Science Data Center at the Johns Hopkins University Applied Physics Laboratory in Laurel, MD. A 25-minute flyby of the asteroid by NASA's Near Earth Asteroid Rendezvous (NEAR) spacecraft on June 27 has resulted in spectacular images of a dark, crater-battered little world assumed to date from the beginning of the solar system.

The Mathilde flyby is the closest encounter with an asteroid to date and the first with a C-type asteroid. The asteroid's mean diameter was found to be 33 miles (52 kilometers), which is somewhat smaller than researchers originally estimated. A study of the asteroid's albedo (brightness or reflective power) shows that it reflects three percent of the Sun's light, making it twice as dark as a chunk of charcoal. Such a dark surface is believed to consist of carbon-rich material that has not been altered by planet-building processes, which melt and mix up the solar system's original building block materials.

The Mathilde flyby met all its initial goals: getting a clear image of the sunlit side of the asteroid, getting color images that will give clues to the types of rock that make up the asteroid, and getting images that will help researchers determine if Mathilde has any moons. In the next month, scientists expect to complete initial analysis of their data and have improved measurements of Mathilde's volume, mass, and density.

"The Mathilde encounter was one of the most successful flybys of all time," said Dr. Robert W. Farquhar, of the Applied Physics Laboratory, NEAR Mission Director. "We got images that were far better than we thought possible, especially since the spacecraft was not designed for a fast flyby."

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Only the multispectral imager, one of six instruments on the spacecraft, was used during the flyby in order to conserve power provided by solar-powered panels. The spacecraft was approximately 186 million miles from the Sun, too far to provide power for NEAR's other instruments.

"Even though this was a very difficult undertaking," said Dr. Stamatios M. Krimigis, head of the APL Space Department that managed the program for NASA, "the NEAR Operations Team was so well prepared there was little doubt that it would succeed; not only that, but this was the smallest operations team of any planetary encounter, proving that the Discovery Program paradigm of 'smaller, faster, cheaper' is alive and well."

Although Mathilde proved to be rounder than asteroids such as Gaspra and Ida, Dr. Joseph Veverka of Cornell University, Ithaca, NY, who leads the mission's imaging science team, said, "Mathilde turned out to be more irregularly shaped than most of us expected. The degree to which the asteroid has been battered by collisions is astounding. At first glance there are more huge craters than there is asteroid."

The imager found at least five craters larger than 12 miles (20 kilometers) in diameter just on the lighted side of the asteroid. Scientists wonder how the asteroid can remain intact after having been hit by this many projectiles, each probably at least a mile wide.

The craters reveal evidence of the asteroid's makeup. "We knew that C-asteroids are black, but we did not expect their surfaces to be as uniformly black and colorless as Mathilde's surface turned out to be," Veverka said. "This global blandness is an important clue telling us that asteroids such as Mathilde are made of the same dark, black rock throughout because none of the craters, which are punched deep into the asteroid, show evidence of any other kind of rock." Such uniformity seems to confirm that C-type asteroids are in fact pristine samples of the primitive building blocks of the larger planets.

Dr. Donald K. Yeomans of the Jet Propulsion Laboratory, Pasadena, CA, who heads the radio science team formed to determine Mathilde's mass said, "Mathilde is an asteroid with a very tortured past." By determining the bulk density of the asteroid, researchers will have a clue to how it was formed. A composite of objects would have a lower density than a solid chunk from a larger asteroid. Data analysis to determine density will not be complete until later this year, but Dr. Yeomans said, "Preliminary results suggest that Mathilde is much less dense than we had thought."

One mystery that remains is Mathilde's extraordinarily slow (17.4 days) rotation rate. Its collision history could be a factor, but more research needs to be done to determine what role such collisions have played. The search for Mathilde moons continues; none has yet been discovered.

-more-

The next major event of the NEAR mission will occur on July 3, when the spacecraft's bi-propellant engine is fired to head NEAR back toward Earth. This deep-space maneuver will be the first time the engine has been fired and will keep both engineers and scientists in suspense for 11 minutes before they know if the maneuver was successful. An Earth gravity-assist maneuver on Jan. 23, 1998, will send the spacecraft toward its primary target, asteroid 433 Eros. NEAR will reach Eros nearly a year later and will remain locked in orbit around the asteroid until Feb. 6, 2000, when the mission ends.

Commenting on the success of the Mathilde flyby soon after the first images were received, Dr. Wesley T. Huntress Jr., NASA Associate Administrator, Office of Space Science, said, "It's today that the Discovery Program really begins. NEAR was the first of our Discovery missions to be launched and it's the first to return scientific results." He said the APL-led team that managed the NEAR program proved the concept behind the Discovery Program: that exciting planetary missions can be done at low cost, in a short time.

The NEAR spacecraft was launched Feb. 17, 1996, from Cape Canaveral Air Station in Florida. NEAR Science Team Group Leaders are: Joseph Veverka, Cornell University; Jacob I. Trombka, NASA/Goddard Space Flight Center, Greenbelt, MD; Mario H. Acuna, NASA/Goddard; Maria T. Zuber, MIT and NASA/Goddard; and Donald K. Yeomans, NASA/Jet Propulsion Laboratory, Pasadena, CA. Andrew Cheng, JHU/APL, is the Project Scientist. The Johns Hopkins University Applied Physics Laboratory operates the mission for NASA's Office of Space Science, Headquarters, Washington, DC.

-end-

EDITOR'S NOTE: Images of Mathilde and the NEAR spacecraft are available for media representatives by calling the Headquarters Imaging Branch on 202/358-1900, or the JHUAPL Public Affairs Office at 301/953-5113.

NASA Photo numbers (black and white only) are:
97-H-446; 97-H-447; 97-H-448; 97-H-449; and 97-H-450

Mathilde flyby images and updates can be obtained on the Mathilde homepage at:

http://sd-www.jhuapl.edu/NEAR/Mathilde